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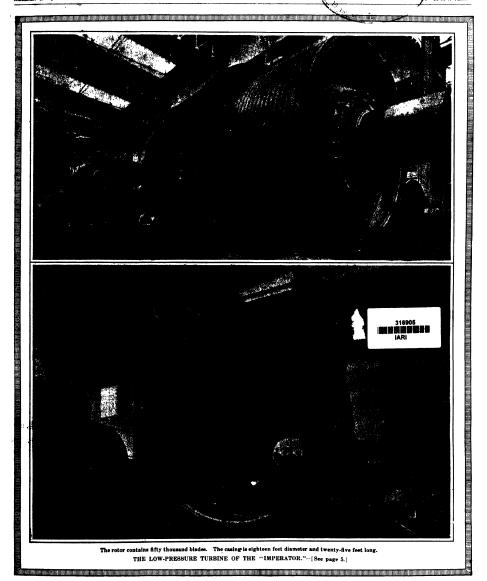
# SCIENTIFICAMERICAN STATES OF THE STATES OF T

# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

WOLUME CVIL

NEW YORK, JULY 6, 1912

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The purpose of this journal is to record accu-itely, simply, and interestingly, the world's rogress in scientific knowledge and industrial

#### High Speed Through the Ice Fields

THE Board of Trade inquiry into the loss of the "Titanio," which is being held under Lord Mersey, naturally is eliciting more detailed evidence than it was possible to gather during the necessarily limited investigation by our Senate Committee. Thus far, some very startling testimony has been given (startling at least to the lay mind) by certain of the cutartung at ceast to the say much my everain of the more important witnesses. Mr. Ismay, for instance, gave an unqualified endorsement of the course followed by Capt. Smith, of the "Titanio," in proceeding at full speed after he had received several warnings that there was heavy ice ahead of the ship. The witness nade the point that, by traveling at high speed, the 'Titanic' would have been sooner through the zone of danger and out in clear water again. The argument is familiar. We have heard the same thing said in justification of traveling at high speed through a belt of

So important is this testimony in the light which it So important is this testimony in the light which it is throw on the risks of transstantic travel, that we have made personal unquiry among the navigating officers of several first-class passenger ships, and we find that if the weather is clear, it is the univorsal practice not to slow down the ship, even though it be well known, through wireless despatches, that there is a field of ice shoad. "We never stop for ice in clear weather," said one officer of an English ship. "The course followed by Capt. Smith was perfectly justified,"
was the comment of the leading officer on one of the was the comment of the leading onicer of one of the fastest German slips. Indeed, the consensus of this expert opinion, without an exception, justified the high speed of the "Titanic," as being in accordance with the recognized practice under such conditions on bridge of all transatiantic steamships. It seems to be universally held that, if a good lookout is kept on such a clear night as that of April 14th, it is practically impossible to avoid seeing an iceberg, long before it gets into dangerous proximity to the ship. Obviously, then, one of the lessons of this disaster is that now and again, even though the night be clear, there will occur conditions, such as a smooth sea and an iceberg of a color that approximates to the general coloring of the sea, which may make it impossible to detect the joe

make it impossible to devote the loc in time to avoid collision, and so may render a repetition of the "Titanic" disaster inevitable. It would seem from testimony given before the Board of Trade that conditions did render it extremely noard of Trace that conditions do render it extremely difficult to see this particular incherg. One officer of the "Titanic" testified "everything was against us," meaning that the size of the iceberg, its color and the absence of broken water at its base, made it practically impossible to detect the obstruction until it was close aboard

was close aboaru
In our investigation, above referred to, we found a
consensus of opinion, also, that the chances of avoiding
the ice when it was once sighted were as good, if not when the ship was running at high speed than when she was running under a slow bell; it being claimed that the ship would answer her helm more quickly at high than she would at low speed; which is undoubtedly true.

Now, since the steamship companies wish their ships to be run at full speed, if possible, all the way across the Atlantic; since the officers in command of the ships are unanimously in favor of high speed; and since the public, except when it is in a panie over some portentous disaster, in certainly in favor of high speed; it is mfe to seems that appeal will not be identiced in the distinct oither in fog or among the long. Align widthing the 40,000 to 70,000 tons will continue to go hardling their 40,000 to 70,000 tons will continue to go hardling their vary-across the Atlantis, whether by night or by day, crueting to the sharp ore and the steady hand to award disaster. Evidently, if several is to be made sharplying each, that is to say, if the "Thanke" of the future award not occasionally to be sent to the bottom at slaper warning, carrying a multitude of people with them, something should be done to enable the airly undefinable under those special conditions when "everything in against" the ship and the lessen over and the steady hand are not sufficient to prevent catastrophs.

The Beard of Trade inquiry now going ou in London

hand are not sufficient to prevent eatsatrophs. The Board of Trade inquiry now going on in London will fall pitifully of its purpose, if it does not make such changes in the laws governing the structural requiriments for safety in future ships as shall make them practically unsinkable by collision, whether with agother ship, as in the case of the "Riganic," or with the decellet, as in the case of the "Titanic," or with the decellet, as in the case of many a good ship that has safed and never been heard of again.

#### Battle Efficiency and Navy Appropriations

HE reluctance of the House of Representatives to provide the necessary appropriations to carry out the very reasonable program for maintaining our Navy at its proper relative strength, looks like a very poor recognition of the high state of efficiency to

hich our existing fleets have been carried. There may be other departments of the Govern which can show an equal rate of improvement; but we wmon can anow as equal rate or improvement; out we are certain that there are none which can exset the record which has been made during the past two or three years by our Navy Department. At the last analysis, the object of the money which has been spent and the infinite care, thought, patience,

has been spent and the infinite care, thought, patience, and hard work, which have so markedly characterised every branch of the Navy Department, is the main-tenance on the high seas of a fleet of battleships and crusers, characterised by the highest efficiency, and at all times ready for immediate action at the Government.

Government. Everyone who is at all familiar with conditions in the Navy to-day knows that this efficiency has been realised beyond the most canguine expectation. Not only are the latest battleships which have gone into the world in the accuracy and rapidity of their

from the longest ranges.

The fighting efficiency of our battleships of to-day, as compared with that of the fiest which fought under Sampson and Schley during the Spanish-American war, shows an improvement which is scarcely believable except by those who, like the writer, have had an opportunity to witness the work of the fleet from one of the battleships engaged. This improvement has cinctly stated by Mr. Meyer, th of the Navy, more than once during the past few months. A comparison shows that, whereas the percentage of hits in 1898 was 3½ with the large guns, firing about once in five minutes at short range, the percentage of hits in the firing last year at the San Marcou was 33 1/3. must in the firing last year at the ban Marcou was 23 1/5, the range being 1,0000 yeards, and the present rate of firing a single 12-inch gus being about ten shots in five minutes. This rather overestimates the work at Santiago and underestimates the work to-day. A roughly drawn companion above that we are about 1,200 times better in gunnery efficiency than we were a faction of Santineous.

So far then as the ability of our battleships and cruisers to hit the enemy hard and often at great ranges cruees to me the enemy hard and often at great ranges is concerned, it is certain, if we may adopt a current phrase, that the country is "getting its money's worth," If the pruning knife of economy must be used, it would be wise, surely, to spare a tree which is yielding such abundant fruit.

#### A New Method of Testing Coal

A New Method of Testing Ceal

S a test of the value and character of fuel, the
discovery of the amount of votatile matter in
cool is unpersionably of the very greaker
importance. This is sufmated by finding the fose in
weight of about fifteen grains of a sample, by bringing
it to a high temperature in a plaintum dish. This simple procedure really gives more information than any
detailed chemical or colorimation scalarist.

However, the complete accuracy of the test is not
always possible. The weight, length, bracketh, and,
intensity of the fame and the beat, as well as the judiciant
mum recognised which holds the sample, the nort of
sas and burner, the distance, time, and other confidence
time, all have some efficies upon the results, that is
upon the residue left and the velagite masters driven.

The committee on coal analysis of the American Chemical Society over twelve years ago made an ex-

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he distant for the medium plants of the control of waterlife materials. In the control of waterlife materials are selected to the control of the control of

pass, where well give a love to the difference in the cole produced from various sessions, which will account for the givens of excellence which will account for the givens of excellence and case. If will show a gualitative distinction broaders the satisfact the vasious types of soci, and statuture the facing of the old mothed, the picture will be sent to be first, clauses to which makes of the uniquely excellence to be first, clauses the white makes of the statuture, and fictionize could five due to the agriculture size of excellence and make and contract of the action of the statuture which the statuture which are considered as the contract of the picture of the picture of the statuture which was considered by sufficient of the picture of the p

and vapors are allowed free play.

Dr. Lessing's apparatus consists of a heating tube, a quarte glass cylinder. This non-conducting medium may have an selective resistance off of pitallium whre wound directly around it. Numerous glass pia points are heat on this tube to loss pite turns of the pitalium off apart. In order to concentrate the heat where it is required, the platitum wive is first wound to a close oot and this is wound around the cylinder tube. The coil attaches itself by its own disacticity. This coils are close at the bottom of the cylinder, getting wider and wider and wider apart, so that the beas is just mough to keep the coal tar volatilised. Another "rescrings" glass vessel file loosely into the other "heating" tribe. glass vessel fits loosely into the other "heating" ! Its interval diameter is about one third of an inch.

glass vessel fits locaety into the other "heating" tribe. Its interval diameter is about one bird of a fixed in Fifteen grains of the powdered cost are placed in the inner tube, and into a third tube which telescopes into the other inner tube. By altering the weight of this innermost tube or filling it with different amounts of quarta powder, during the test various pressures may be exected on the cost.

The outsernout tube is buried in an insulating substance such as kieselgulir. A cheestal consistent with the furnace allows various changes of resistance and the temperature may be accordingly altered. The test is made, by weighing the cost almost outside tube. Then the innermost tube is inserted over this and the temperature may be accordingly altered. The test is made, by weighing the cost into the middle tube. Then the innermost tube is inserted over this and the temperature below which the outsides, insulated tube. As the current is turned into the platinum cost, the temperature downly rises, allowing the graditions and stops of carbanization to be research. First, tree moisture, then concluded guess, some to be followed by intry apport, will be seen inconsing in volume. All this depends upon the kind of coul testard. The heaving the individual super time in the intervention to the tree report to the. The value test, requires adjoint at relation, and is than permitted to each. The only obstanted shows conglitions, of each light of each made of each. Bay particular, most in the principal considerable show the principal considerable shows conglitions, a cite desirable and the intervention of each light of each made in the large such as conglitions, a cite desirable and the size of each light of each in the gradity and the confidence of the first of each light of

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famine and five foreign, presided over by the chief pro
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lams take for receiving contributions for the concourse is

March 31st, 1944, and further information can be ob
stained from the secretary of the Monadors association

at large, Beignium, 31 rue Salant-Gilbes.

Assumery of Shectric Meters Under Intermittent Rades.—Clerkin ortical consumers of electrical energy who have noted that their electric meters keep on running for one or two encodes after the lights are turned out or the elevator or other motor is shut down, may have imagend has their sensors were overcharging them by this action. These psesons can have their fears alleged by the conclusions of a paper on "Electrical Meters under Variable Loads," security read shotors the British Institution of Electrical Engineers, viv., that errors due to intermittent hoofs are relatively small in meters of the type generally used in the United Shatos, designed with the Prosenti braiding disk. The fact is liable to be overlooked that the inertial or the most which course the latest or turn or a moment after the current is interrupted, will also tend to prevent the nester from strating for a moment after the circuit of circuit is

Electricity from Pest.—European engineers are engaged at present in the investigation of methods of utilizing peats at full in electric stations. Southern Bavaria, for instance, has vast peat fields which would serve to run electric plants of large site and this would give a great reserve of power. The pest begs its mately in the region of the Dambe, and are estimated to over an area of 500 square miles. Supposing the pest layer to be only 3 feet in thickness and the ouble foot of peat to afford but 3 pounds of fuel, this will mean a supply of 50 million tion. With the operation of extracting the peat regularly carried on during the year for 300 days, this sea afford 100,000 horse-power in the space of 50 years. The fuel can be burned under bolzer or it can be used in special can be over a supply of gas for industrial pur-

Hydro-electric Piants in Iceland.—Losland possesses a large amount of power in the shape of waterfalls, and for some time past the question of obtaining an electrical supply from shem has been under consideration, but what makes the matter difficult is that most of the fall lie at great distances from the coast and are far from the centers of population. There are however many other falls which could be utilised. Quite recently a Frebch rychicate purchased a large ortent of ground in the neighborhood of Thorlakabaven, as well as several large waterfalls situated in the meantain regions in the interior. It is stated that the falls will be able to furnish as much as 200,000 horse-power. The present syndicate is to construct a good port upon its ground and it will furnish a supply of cargent to different industries which are situated in this district. One of the newest enterprises will be the construction of works for manufacturing nitrogenous products on the Biriceland-Ryde electric system.

genous products on the Biricoland-Byde electric system.

Hospitic Light Review in Denmark.—According to recent information, about the progress of selectic light and porcer industries in Denmark, it appears that all the towns of 5.000 inhabitants and over ear now provided with public electric service. As to towns bying between A,000 and 5.000 inhabitants chosen are only three in which electric interest to the control of the

#### Science

A Bussies Worth Sider Expedition is being planned by Chipt. Bodow, who has had considerable experience in supporting made Arestic conditions, having led an expedition to the most of the Ectyma in 1999, and one to Nova Cambia in 1301. Statelow proposes to proceed in a ship to Franz Josef Land, and thence to attempt a stedge coursey over the les to Greenland, by way of the pole. He has announced his intention of naming any land, and thus counts on securing the patriotic support of the Russians when the following the second on securing the patriotic support of the Russians to his undertabling. There has been some talk in the Bussian Duma of providing the explorer with a government vessal, by the especially constructed for fee-oruning, in accordance with an old plan of the late Admiral Makaroff.

The Asserbates Astacette Expedition, under Dr. Mawron, has not only proved the existence, over a distance of score 1,200 miles, of Wilkes Land, which has been a bone of contention between American and European geographers for seventy-odd years, but has actually landed two patties on fit; one, under Mawron himself, meetly at the east end of this coast, at Point Aiden, in the castem part of Adelie Land; the other, under Mr. Wild, about 1,200 miles further west, in the part of the coast has was anamed by Wilkes Termination Land and that has lithered been either ignored or marked with a note of microgration on all European many. The landing of microgration on the precipiton is one-silf of a glacier about 100 feet high. Wild's party was accomplished with great difficulty, on the precipitons iso-silf of a glacier about 100 feet high. A year's stores had to be holsted to the top by means of since-legs. Besides these two parties in Aniarctics, the expedition landed for men at Macquario Island, where a wireless teigersph station was installed. The "Autora," the ship of the expedition, and will return to relieve the exploring parties in the southern summer of 1912-133. Meantime, she will carry on noesanographic research—for which she is specially equipple—to be south of Australia.

Sea Rostes to Siberia.—Contrary to previous reports, it now appears that the plans of the English captain, Webster, to establish, regular steamable communication between European ports and northwestern Siberia by way of the Arctic Ocean and Kars Sea have been disapproved by the Russian government, obviously for the reason that this bold undertaking, which appeared to be entirely feasible, would have diverted considerable to be entirely feasible, would have diverted considerable to be entirely feasible, would have diverted considerable to the extablishment of communication by sea between Public ports and northwestern Siberia, was British establishment of communication by sea between Public ports and northwestern Siberia, was English Sirati. A surveying party, under Capt. Granfeld, has proceeded from Yakutak to Nishni Kolymak, at the mouth of the Kedyma River, to make a through investigation of that port, and the geologist, J. P. Tolmatenhew, will study the conditions of navigation between the mouths of the Kodyma and the Lena, including an examination of the Lena delta, with a view to establishing a sea route to the latter region. The loc-breakers "This internation of the Lena delta, with a view to establishing to the Arctic coast of Stories for a crutic at least as far were the contract of the Stories of a Stories of the Stories of Stanfachatta, after which they will proceed on Bering Strait to the Arctic coast of Stories for a crutic at least as far were as the Lena. If the conditions prove favorable these were set the Lena. If the conditions prove favorable these were set the Lena. In the conditions prove favorable these were set the Lena.

Archangel.

An Blish of Life.—At a regent meeting of the French Aandemy of Sciences, Prof. Metchnikoff, Director of the Partour Institute, gave a faceinating account of another atwaces in his struggle against the factors counting scaling. The scientific scientific scientific research has shown the natural decay of the human body to be brought about by the bacterial flora of the instetines. The fact that the Bligarian posants feeding partly on yoghurt, a fermented product of oow milk, reach an astounding longovity, is accounted for by the invasion of beneficial bacteria taking the place of the harmful inhabitants of our digestric organs. Arterioscierosis, selected of the liver and an inflammation of the harmful inhabitants of our digestric organs. Arterioscierosis, selected of the liver and an inflammation of the holdings are the three mandales produced according to Metchnikoff by the poisonsus spiton of our beoteria. Experiments on animatals have shown the two toxins inded and plensif, which are responsible for this poleoning of the body, to be aliesinated by food rich in sugar, bench as flates, beautiful the product, As, horeloves, the sugar destroying the poleonic, As, horeloves, the sugar destroying the poleonic parts of the intention, dois not penctrate as the as, the large intestilies, which contains these dangerous significances are of the alliensteary cancel. Such a means limit income him found is a baundant conspingation of posterous milks. These intentions from a "writd" flora into a contributed to the conversion of our bishedul Vegetation from a "writd" flora into a collegization floration of milks of the indirection from a "writd" flora into a collegization from the production of situation. These introductions from a "writd" flora into a collegization from the production of the himselfield florate to plowed the conversion of our bishedul Vegetation from a "writd" flora into a collegization from the production of the production of

#### Aeronautics

The Death of Harry Turner.—Harry Turner, a nineteen-year-old mechanic in the employ of an aviator in Mincola, was killed recently in his employer's machine. He was making a circle above the field when he attempted to descend. It is not very clear how the accident occurred. Apparently it was due to had handling

The Piret Navy Zeppelin.—The German navy is to have its first Zeppelin airship. Hitherto, the rigid dirighles of Count Zeppelin have been used by the army and by a private company for the transportation of passengers. In its official text, the navy Zeppelin will be required to remain aloft continuously for twenty hours and to early one ton of explosives. Most of the Zeppelins are now equipped with wireless apparatus.

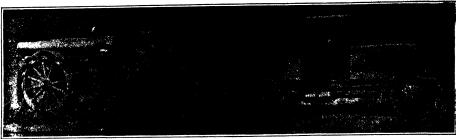
A Parachute Drop from an Aeroplane.—The first successful parachute drop from a flying machine was made on long Island by a venturesome young man named Law, who has been startling the readents of New York by leaping from tall buildings, in a parachute. Law went up with an aviator in a biplane. The parachute was attached to the under side of the lower plane. While the accounts that have been given of the capiort are not very clear, it seems that Law crawfed under the plane hand over hand until he managed to seize the parachute.

Some Beeent German Aviation Exploits.—It is conrous that we have as title in this country of some of the more remarkable ashievements of German aviators. How many people in this country throw of the recent flight from Berlin to Vienna by Hirth with a passenger, in which a mountain range 4,500 feet high was crossed and in which an average speed of more than sixty miles an hour was maintained? It may interest those readers of the Scientific Austracas who have been following our articles on the Gould-Scientific Austracia Austracia Trize that the machine was equipped with two motors and two propositers.

Ariston Insurance—According to United States Consul General A. M. Theologara of Berlin, the business of insuring the limbs and lives of avastors as not very properous in Germany. The rate for the insurance of those who go up in halloons and dirighties has recently been increased, while insurance for those who go up in seroplanes is simply unobtainable. "None of the local companes will now quote rates for the insurance of aviators against death. The rates for accretion insurance of aviators against death. The rates for accretion insurance of aviators against death. The rates for accretion insurance of aviators against death are supplied to the companes will be a supplied to the compane of aviators against death. The rates for accretion insurance of aviators against liability. The rates for the meanment of aviators against liability or damages aroning from injury to other persons range from 20 37,400 for more than one person injured. The rate for insurance against liability for damages to property is 20 per cent of the policy when damages from fire or explosion are not included. The minimum pensitum is \$2.38 and the maximum pinklility \$2.300. The ralse governing this form of insurance against liability for damages are included. The minimum pensitum is \$2.38 and the maximum pinklility \$2.300. The ralse governing this form of insurance against liability for damages. Insurance against inability for damages. Insurance against inability for damages. Insurance against inability for damages in more or insurance against the same as for or insurance against liability for damages. Insurance against inability for damages for more or insurance or or insurance or or insurance against liability for damages. Insurance against liability for damages to properly in the case of accordance and the accident insurance are usually written on ongestion insurance liability to redisary accident insurance are the same as for or this combined insurance are the same as for or this combined insurance are the same as for or this combined insur

The Naval Acceptance.—In a book entitled "Aviation the Navy". Ident. E. Lapointe of the French mavy discusses the relative merits of the hydro-acrephane and of the accrollance which start from and alights on the deck of a battleship. He points out that the hydro-acrephane is not favored by sailors because it is useful only in absolutely still water. To alight on the water, he argues, is no great advantage accept perhaps for a great soroplane acting independently of a ship and attempting to make a protrated or crise. He proposes that a competition be held for a naval acrophane which, by means or special floats, waterlight bodies, or even fixed wings serving as floats, has the ability to float on a moderate sea and in a moderate brezes for several hours in this position, it can be overhauled and put in operation in a few minutes. It must be possible to holst the machine from the water and land it on a ship's deck by the ship's cause. It must be able to start from or land upon the shore under ordinary conditions. Licut. Lapointo distinguishes between an acceptance south to carry two passengers, a pilot and an observer, for three hours without singuishes thereon an acceptance south to carry two passengers, a pilot and an observer for three hours when a carry weight of 100 pounds, giving a botal weight carried. All pounds are considered with an extra load of 200 pounds, giving a told weight carried of 670 pounds.





The 11-inch howitzer is hauled by motor cars.

# A New Type of Powerful Mortar

## The Krupp Eleven-inch Howitzer and Portable Carriage

By the English Correspondent of the Scientific American

OWING to the development that has taken place in medical and construction of protective works in connection with fortifications, where ever-increasing strength is secured to the point almost of invulnerability, there has been a demand for more powerful and heavier weapons of attack. There is no doubt but that in the next war between any two of the foremost powers, greater stress will be haid upon the artillery. The war between Riessan and Japan emphasized that factor to a convincing degree when, although the Japanese brought the latest skill in military secone to bear upon Port. Arthur, they made but little impression with their fire upon the permanent works. This attack was remarkable for the fact that in the attack the Japanese employed the heavests arm that has ever

been directed against fortifications—a 28-centimeter or 11-inch mortar

or H-inch morfar
In Russia, Austria-Hungary and France weapons
of this type of 23, 24, and
27 centimeters, respectiveby, are in severe, but in
every instance they are
practically permanent defense pieces, demanding a
solid firing platform. Accordingly, if the occasion
arises for the arm to be
removed from one point
to another, the operation
is one of great difficulty
and occupies considerable considerable.

Realizing the deficioncy in mobility, the Krupp firm has designed a new type of mortar of this character, the outcanding feature of which is that it is mounted upon a gun carriago, so that it can be moved from point to point, and can even be attached to the artiflery in field operations. This end is achieved without any sacrifice of ballistic efficiency, by the application of a long invariable resoil, and by the employment of wheels fitted with feet after the manner of the Diplock nedral

The Krupp designation of this prece as a houstrer is to distinguish it from the mortar proper, reserving the interest in the form that an angle exceeding 46 degrees. This new arm has a greater variation in its elevation, so that it really is more flexible in use. The two terms however are now so generally confounded that it may be classed as a mortar.

The barrel is made of

steel and comprises the inner bore and a packet, the total length beng 11 feet. The opening and closing of the breveh re-effected by turning a handle through a horizontal are for about 135 degrees, and there is a safety device operated by hand to prevent prematures firing or the accidental opening of the breveh. After the discharge, the spent certridge is automatically spected by the opening of the breveh block. Owing to the principle of construction, the opening and closing to the principle of construction, the opening and closing of the breveh can be effected usily by one hand and in a few seconds, notwithstanding that it weighs over

The carriage upon which the arm is mounted comprises in reality two vehicles. The barrel or mortar proper is carried upon one carriage, while the other carries the mounting with the recoil brake and the two arr reservoirs. In transport the two pieces are hauled separately, the main whole of each carriage being shod with freel, so as to permit passage over soft ground without sinking, while haulage is carried out by gasoline motor cars, as being more suited to the work than horses. Upon arriving at the position of firing, the mounting earrage is planted first, and then the second carriage is moved up from the rear, until the bore is in line with the cradle of the mounting. By means of thin wire cables and pulleys the mortar is pulled from its own carriage, and sildes over special guides through the opening in the second carriage, until it is in the designed position, where it is made fast and connected up. The second carriage is then withdrawn, leaving the arm complete a

CONTRACTOR OF THE PARTY BEAUTY FOR

upon the mounting carriage and ready for firing.

The training near gives a maximum elevation to the mortar of 65 degrees and works upon a rapid system. The weepon can also be moved 5 degrees on either side in the horzontal plane. The upper part of the eradic into which the bore slides carries a group of three cylinders. The central cylinder is the recoil brake, while that on either side is an air reservoir. The recoil brake while that on either side is an air reservoir. The precoil brake differs from the type adopted in connection with field guns. The gun is not connected to the brake cylinder shout to the piston rod. Consequently, it is the piston rod and the piston rod and the piston rod and the piston rod and result of the gun. the brake cylinder remaining stationary. The air reservoirs consist essentially of an air cylinder, a ram with piston rod and piston, and a piston rod and piston, and a piston rod and piston rod and

The howitzer fires a shell weighting 136 pounds, and the charging of the weapon requires the aid of six or eight men, the explosive charge weighing 38 pounds. By using one of eight different charges, it is possible to vary the initial velocity from 500 to 1.115 feet per second. It is possible to vary the initial velocity from 500 to 1.115 feet per second. It is possible to accure, with all distances exceeding 7.218 feet a falling angle for the shell exceeding 7.218 feet a falling angle for the shell exceeding 7.218 feet a falling angle for the shell exceeding 12 degrees. The weight of the projectile is more than twice that of the next most powerful weapon of its class, while its range is 30 per coast higher is reason.



The mortar being transferred from its transport cradle to the mounting



Bore, 11 fachos, length, 11 fost, shell, 186 pounds, powder, 38 pounds, maximum elevation, 65 degrees; maximum range at 65 degrees 24,378 feet, maximum range at 42 ½ degrees, 33,185 feet, anobile 11-inch mortar for field service,

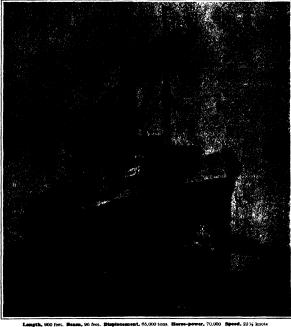
# The Largest Ship Yet Constructed

The Launch of the 65,000 Ton Liner "Imperator"

Witth the loss of the will the public mind, special interest at ta 6 h e to the recent launch of the "Imperator," which acceeds that huge vessel by some 5,000 tons. The ship is being built for the Hamburg-American Company at the Vulean Yard at Hamburg, and the ceremony of naming the ship at the launching was performed by the Kaiser, whose interest in the German merchant marine is second only to that which he has shown in the upbuilding of the German

The length of the "Imperator" is 900 feet, and she thus has the distinction of being the first ship to come within 100 feet of the 1,000-foot ship of which naval srahlteets have been wont to speak in late years in naming the possibilities of length which might be reached before many years have passed. Her beam is 96 feet and her molied depth 62 feet. From the keel to the boat deck will be 100 feet and the distance from the keel to the trucks of the master will be 246 feet. The three funnels will be oval in section, measuring 18 feet on the smaller and 29 from the decrease of the master will be 245 feet. The product of the rudder will be 215 feet. The side will be 215 feet.

The slup will be driven by turbines of 70,000 horsepower which will be developed on four shafts,



Longth, 900 feet. Beam, 96 feet. Displacement, 65,000 tons. Herse-power, 70,000 Speed, 22 ½ knots
Passenger capacity, 4,100 Crew, 1,100

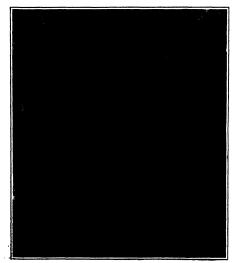
The "Imperator"—largest ship affoat to-day.

and the estimated speed of the ship is  $22 \frac{1}{2}$  knots. She will be equipped with water-tube boilers.

She will be equipped with water-tube boilors.

A feature of the ship which will be apprenated by passengers is that she will be fitted with the Frahm anti-rolling tanks, otherwise known from their shape as "U" tanks. This drive consists of tanks of large capacity, built on opposite sides of the vessel and connected by an inclosed water-way, through which the water can flow from side to ade of the ship as she rolls, its flow being subject to control by valves. Experience in the few passenger ships which have been thus equipped has shown the Frahm tanks to be the most efficient anti-

with the "Fitnen" disseter so recent a fact,
the questions which at one
arms with regard to the
"Imperator" are those relating to her internal construction and particularly
her construction below the
water line. What provision
has been made for meeting
such a devastating accedent as that which sent the
hige "Titanie" to the bottom in two hours and
thirty minutes? It will
be remembered that in our
article in the Scientific American of May 11th,
we advised either the
use of a double skin below
the water line, or the construction of longitudinal
builtens carried along the
sides of the vessel in the
vessel in the vessel in the



Swelled out portion contains wing propeller shaft Eliveting the outer skin upon the after part of the ship,



Note the enormous length of this deck. The men in the forground afford a scale of size

Laying the steel plating upon the deck beams.

wake of the boiler rooms. The sub-division of the tor" below the water line has been carried under the supervision of the Germanic Lloyd's and the under the supervision of the Germane Loyd's and ore immigration authorities. It consists of a series of intersecting transverse and longitudinal bulkheads. Transversely, the ship is subdivided by twelve bulk-heads, which are carried two decks above the water line, with the exception of the collision bulkhead forward, which extends four decks above the same let ward, which extends four does a more the same reco-ffuse bulkhads are intersected by longitudinal bulk-heads, which subdivide the boder and eignne rooms, the under water portion of the slip being divided altogether into twenty-four separate watertight com-partments. There are four boder rooms, containing the water-tube boilers, the type used on this ship The coal bunkers are placed above the boiler rooms and along the sides of the ship, in the latter case being known as wing benkers. The longitudinal bulkheads are placed about nineteen or twenty feet in from the ande of the ship, and they extend from bulkhead No. 4, aft to bulkhead No. 8 Astern of the aftermost 4, aft to bulkhead No. 8 Astern of the attermost boiler room is the forward turbine engine room, which is protected against flooding by two wing bulkheads, between which and the sides of the ship are placed the The after turbine room is divided by a

central longitudinal bulkhead. Because of its great size, special interest attaches to the turbine installation. We present illustrations of one of the low-pressure turbines, from which one can one of the low-pressure tuchnes, from which one ean gain a virid impression of the great size and weight of the various parts. The rotor, or rotating part, con-tains 50,000 blacks, and is capable of developing over 22,000 horse-power. The easing is 18 feet in diameter and 25 feet long. The shafting of all four propellers is 1½ feet in diameter. The propellers, which are made of turbudum bronzo, are 16 feet 8 inches in diameter. Although the engines are spoken of as being of 70,000 horse-power, it is probable that on test they will develop from 80,000 to 85,000 horse-power.

the familiar Richard barograph. In the latter the recording appratus consists of a system of mechanical levers and a nen, registering on a revolving critical levers and the continuation of the continuation of levers and pivots in the nature of things obliterates all of the delicate and rapid motions that would occur in the cells if they were disconnected from the recording apparatus, so that only the grosser changes of pressure are indicated. The new instrument makes its record by the interference of light. A plane chass plats, sil-vered on its upper surface, is fixed horizontally on top of the uppermost anerold cell, and rises and falls with A second glass plate, thinly slivered on the under side, is fixed rigidly above and parallel to the moving plate; the two plates form the interference system.

The source of light is a mercury vapor lamp placed almost directly above the interference plates. A camera adjusted as to photograph the circular interference bands through a slit, the resulting image a strip along a diameter of the circles. The image is sed upon a film moving at a uniform rate the circles expand and contract, with changes in pres sure, each interference band makes its record as a wavy or sinuous line. The exact time is registered on the of simons like the device of interrupting the light for an instant at the end of each minute. The motion of the cells is magnified, by this device, about 50,000

#### Phosphorus Slag as an Insecticide

THE slag or dross formed in the removal of photograms phorus from iron ore has been for years used as a fertilizer, on account of the phosphorus that it contains, and also on account of the lime Recent investigation has shown that the use of this slag is even more profitable than had at first been suppo

The cultivation of the sugar beet in Germany suffers great damage from the plant louse. The depredations

#### The Foundering of a Ja AB

The second secon

A Remerkable Letter

On April 16th last, submarice No. 6 of the Imperial Japanese navy was lost while manuvering in Hipsalmand Month of the Market No. 6 of the Land of the Wasselmanded by Lieut. Takums Factorus, and after the vassel was raised, a letter of farewall from him was from dis how coning tower. This remarkable document will be read with interest. The translation from the original published in the Japanese press, appeared in the Kebe Heroid, and is as follows:

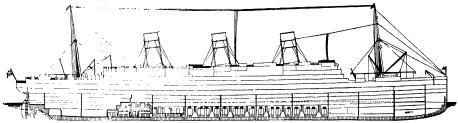
"Although them is indeed no symme to make for the

Heraid, and is as follows:

"Although there is indeed no excuse to make for the sinking of his Imperial Majesty's boat, and for the doing away of subordinates through my heedlesmes, all on board the boat have discharged their duties well and in everything acted calmly until death. Although we are everything asted earmly until destri. Authorizin we see departing in pursuance of our duty to the state the only regret we have is due to anxiety lest the men of the world musunderstand the matter, and that thereby a blow may be given to the future development of the automarines. Gentlemen, we hope you will be increasingly diligent without misunderstanding the cause of the accident, and without mistingerstanding the cause of the sourceut, and that you will devote your full strength to investigate everything, and so secure the future development of submarines. If this be done we shall have nothing to

submarines. If this be done we shall have nothing to regret.
"While going through gasoline submarine exercise we submerged too far, and whan we attempted to shut the sluce valve, the chain in the meantime gave way.
"Then we tried to close the sluce valve by hand, but it was then too late, the rear part being full of water, and the boat sank at an angle of about 25 degrees. The boat rested at an inoline of about 12 degrees pointing toward the stern. The switchboard being under water the electron lights gave out. Offensuve gas developed and respiratory in the stern of the tric lights gave out. Offensive gas developed and respi tion became difficult. About 10 A. M. on the 15th the boat sank, and under this offensive gas we endeavored to expel the water by hand pumps.

'At the same time the vessel was being submerged we



rse bulkheads amidship are carried two d cks above the water line, the height increasing toward the ends. There are twenty-four watertight compartments believe Inboard profile of the "Imperator."

The German government, in its supervision of the construction of passenger-carrying ships, pays as much attention to the question of fire-protection as it does attention to the question of inco-protection as it does to that of protection against sinking at sea. The turns of passenger decks on a luge ship of the size of the "Imperator" are filled with a great amount of material of a highly combustible character, such as wainsvotting, passenger stateroom partitions, paint, varnish, and general architectural embellishment. This material would afford highly inflammable fuel, should a fire once obtain a strong hold upon the ship; and the long alleyways, if they were not shut off at intervals by the screens, would afford an easy means for the spread of fire throughout the full length of the deck. To prevont this, light steel bulkheads are run from side to side of the ship throughout the passenger accommoda-tion spaces. They are provided with fire doors and drills are held at regular intervals in which the fire drills are held at regular intervals, in which the me mains are in full service, and the work of closing the smoke doors is carried through by such members of the crew as are detailed for this work. We are informed by the Hamburg-American Company that the "Imperator" will probably make her maiden

trip to New York in the early summer of 1913.

#### The Interferometer Barograph

A NEW device for observing and measuring minute fluctuations in atmospheric pressure is described by Prof. Albert C. Crehore and Major George O Squier U. S. A., in the Bulletin of the Mount Weather Observa The detection of these fluctuations, which occur unceasingly, is a problem that is attracting increasing attention, both from meteorologists and aeromauts. The first apparatus for the purpose was the Shaw-Jinos microbarograph; another was the variograph, introduced two years ago by Schmidt. The principle of the Crehore Squier instrument, however, is entirely new The apparatus includes a set of eight standard aneroid cells. from which the air is exhausted, such as are used in

of these bugs are destructive to a large number of plants. All inixtures or liquors used for spraying plants as a protection against these insects have been applied in vain The "false brown rust" or "curi" of ch is caused by the plant lice, and it cannot be successfully fought because neither liquors nor powders can be made to reach the little animals. When the beet plant is attacked, the leaf curls up and protects the insect against any treatment the farmer apply.

It has been found that by the application of large quantities of nitrates after rains, the beet is stimulated to push out new leaves, which take the place of those destroyed by the plant lice. But this method has its donatory et of the plant free. But this include has its dangers since an excess of nitrogen in the soil may be just as harmful to the plants as the action of the innexets J P Wagner, a sugar beet expert, recontly told the National Society of Agriculture in France of a successful attempt to fight these insects by means of phosphorus sing. He spread about 1,400 pounds of the phosphorus sing to the acre on fields that were in-fested with the plant louse. Not only did this treat ment prevent the insects from attacking the leaves, but ment prevent the macets from actacking the leaves, but they were driven away from leaves they had already attacked. On another field the slag was applied in larger quantities. Every plant was already attacked by the insects when the dross was applied. Within eight days all the insects had disappeared, and the

plants recovered their healthy appearance and color.

The method by which the phosphorus slag operated in these cases is not known. Wagner thinks that the compound forms a thin layer on the leaf, spreading out over the whole surface, and that it is either dis-tanteful or injurious to the insect. It is well known that many lime compounds are injurious to animals with soft, naked skins such as snails, caterpillars. maked larve; but it has not been shown that a similar effect is actually produced in the treatment against plant lice with phosphorus siag.

expelled the water from the main tank. The light having

expelled the water from the main tank. The light having gone out the gage cannot be seen, but we know the water has been expelled from the main tank. "We cannot use the electric ourrent entirely; the electric liquid is overflowing, but no salt water has en-tered and chloring gas has not developed. We only rely upon the hand pump now. The above has been written under the light of the conning tower, when it was shout 11:45 o'clock. We are now scaked by the water which has made its way in. Our clothes are pretty wet and we feel cold. I had always been used to ware my shipmates that their behavior (on an emergency) should be eain that their behavior (on an emergency) should be calm and delicate, while brave; otherwise we could not hope and delicate, while brave; otherwise we could not hope for development and progress, and that at the same time one should not cultivate excessive delicacy, lest work should be retarded. People may be tempted to ridicule this after this failure, but I am perfeculty confidant that my previous words have not been mistaken. The depth gage of the coming tower indicates 52 feet, and despite the andsavor to expel the water, the pump stopped, and did not work after 12 o'colot. The depth in this megitborhood being 10 fathoms, the reading may be con

"The officers and men of submarines must be app from the most distinguished among the distinguished, or there will be annoyance in cases like this. Happily all the members of this crew have discharged their duties well, and I am satisfied. I have always expected death whenever I left my home, and therefore my will is aiready

whenever I left my home, and therefore my will is already in the drawer at Karasaki. (This remark applies only to my private affairs, and it is not necessary. Measure, Taquehi and Assuni please inform my father of this?,

"I respectfully request that none of the families left by my subordinates shall suffer. The only thing I am anxious about it this. (Atmospheric pressure is increasing, and I feel as if any tympassum were breaking).

"12:20 o'color, respiration is enterordinary difficult. I mean I am breathing gasoline. I am intoxicated with reaching.

olir

"It is 12:40 o'clock."

#### Corresnondence

[The editors are not responsible for statements used in the correspondence column. Anonymous communications council be considered, but the names of prrespondents will be withheld when so desired.]

#### The Wright Machine in the National Museu

To the Editor of the SCIENTIFIC AMERICAN:

Referring to the suggestion in "Aeronauties" column of a recent issue of the Scientific American that a naof a recent issue of the SCIENTIFIC ASSURCAN that a na-tional museum should sequite an early Wright Sying mashins, it may interest you to know that the machine which the Wright brothers flow at Fort Myre (Wash-ington) drill grounds, and which was bought by the Government, now hangs in the old building of the Na-tional Museum, having been placed there by the War Department. Washington, D. C.

C. FRANCIS JENKINS.

#### Taxing the Professional Man

To the Editor of the SCIENTIFIC AMERICAN

To the Editor of the SCENTWING ALERICAY:
Replying to your question in the number for May 4th,
page 384, first column: "What State levies a tax on
members of the bar, or, indeed, of any profession?" permit me to say that for eight years, previous to a few years
ago, I carried on business as a professional photographer
at Newport News, Va., and that I paid an annual lionance
fee of \$81.75 for this privilege; part of this fee being for
the city and part for the State. It was my understanding
then that most, if not all, the professions, including the
may a charge in addition to any tax on preperty, both
was a charge in addition to any tax on preperty, both real and personal, including sewing machines and Bowie knives.

I think that this license taxation obtains in other outhern States besides Virginia. Haines Falls, N. Y. SAMUEL E. RUSK.

#### Oregon's Roads

To the Editor of the Scientific American: In reading your Good Roads number of March 16th, I find on page 240 the statement that you were unable to secure any information from the State authorities

ou also state that the total mileage is less than 30,000. I will be pleased to furnish you any information you may wish in the future, but I wish to correct the fig-ures quoted by you Oregon had 34,258 miles of public highway in 1904, according to the United States Public bulletins. My data are not quite complete, but s conservative estimate gives the State practically 40,000 miles to-day. About \$8,000,000 was spent last year by the different counties and road districts.

Two sets of highway bills have been prepared for initiative action this year, both creating the of Intriarve action tim year, both creating the once or State highway engineer. One gives him absolute au-thority and empowers the State to issue bonds, the other makes him an advisory officer and leaves the bond issues to the separate counties. Corvallis, Ore E. F. Ayres, Highway Engineer.

#### The Nut Problem Once More

Those of our readers who have been following the correspondence on the problem originally published on page 174 (February 24th, 1918) will be interested in the letter reproduced below.—Bo.]

To the Editor of the SCIENTIFIC AMERICAN

I offer the following solution of the equation 
$$A=3 \frac{53}{1024} F+1 \frac{452}{1024}$$
 which seems to me to be more

1024 complete than the one you give in your Notes and Queries column, vol. evi., No. 17, page 390:

$$A = 3 F + 1 + \frac{53 F + 452}{1024}.$$

To find what integral value of F will make the fractional part integral, let

2N + 11

$$\frac{2N+11}{17} = P \text{ (integral)}$$

$$2N+11 = 17P$$

$$\frac{17P-11}{2} = 8P-5 + \frac{P-1}{2}$$

From which it is obvious that P = 1 gives the smallest integral value for N and the other letters in order backward.

$$P = 1$$
 $N = 3$ 
 $M = 11$ 
 $F = 204$ 

A = 624 = 1/5 (whole number of nuts) -- 1. Whole number of nuts = 3,121.

New Bedford, Mass. FREDERICK D. STETSON.

#### Is Oxygen a Drug?

To the Editor of the SCIENTIFIC AMERICAN:

I beg to refer to your editorial "Doping Athletes with Oxygen," in issue of April 6th. In the same you with Oxygen," in issue of April 6th. In the same you declare Site Edwins proposal, to feed the Marathon runner with oxygen as with soup and water, to be "amazingly unscientifie." At the same time you make soveral estations, as "oxygen ise," in which "ideas swarm, but it is hard to seize them;" and several statements, such as "Oxygen is a 'drug' that 'dopes' the receptent, quite like many other drugs;" "pure oxygen is a stimulant," but "as with all stimulants, excessive and occasionless use is "and you speak of "oxygen intoxication".

I would consider it in the interest of sound knowledge "oxygen intoxication".

if you would consider in the interest of sound anowenger if you would kindly mention the authority you cute against Sir Edwin's statement, as well as the source of your information. Interested in the subject of oxygen as any man would be who takes good care of his life, and ing my information from authorities which I believe gathering my information from authorities which I believe to be leading. I beg to differ with your opinon. The question whether or in what degree the designations "stimulant," "dops," and "drug" are proper to be used for oxygen should be cleared.

for oxygen about De cleared.

To say that oxygen is a "stimulant" is very nearly correct, but more correct is to say that it is "the physiological stimulant." My authority on hand is Verworn, who in his "Aligemente Physiologic" frequently mentions oxygen as "the only physiological stimulant and energy roducer of living organism "
Among the "all stimulants" in which you seem to class

oxygen, is there any one that is a physiological necessity, or one that forms a predominant physiological condition of life, as is the case with oxygen? If oxygen is a stimu-lant, we cannot do without it: all others are stimulants without which we do better. Similarly, I would ask if among the "drugs" that are "dopes," used to increase cardiac action, or in some way to artificially raise vitality, to exhibates, if among these "doping" substances there is one which is a normal constituent of our system. or which normally circulates in our body fluids? I can nk of none, except perhaps adrenaline

My further contention is that oxygen in the case of a runner is not used as a stimulant, but as a corrective fo "lack of exygen" and "metabolic abnormalities," tha such stimulant as you have reference to is not needed in the case of the runner, and that oxygen in the most natural way can only benefit and never ondanger the susted individual.

The heart of a runner beats abnormally rapid, there-The neart of a runner reasts annormally rapid, incre-fore the mechanical part of the work of the circulatory system is highly efficient and a cardiac stimulant is not required. The real danger for the runner are fatigue and exhaustion. These are due to the accumulation of fatigue products and to lack of oxygen. Fatigue products are dissimilatory products of incomplete combustion. Prin-cipally lactic acid is known to be produced by the work of muscles. Both lactic acid and lack of oxygen are reciprocal in cause and consequence, i e., lack of oxygen, due to the extreme draught under which the respiratory process is placed, is the condition for the formation of products of incomplete combustion; and again, acid products of incomplete communication; and again, actu-products (fatigue products, lactic acid) formed in the muscles and circulating through the blood, result in con-ditions averse to normal oxidation as well as to oxygen absorption; hence lack of oxygen. This is a pathologic condition which can be remedied to a great extent by condition which can be remedied to a great extent by increasing the partal pressure of oxygen for respiration. It should be remembered also that in the case of the short distance runner or of hard work, oxygen consump-tion increases to seven or eight times the normal If our system had enough flexibility to correspond, foeding such increased demand steadily, and if the acid products or-culating in the blood and in the tissues of the lungs would not interfere with adequate oxygen absorption, the organ-ism might continue to be satisfied with a twenty per cent oxygen atmosphere. But experience has shown that such is not the case. Therefore, respiratory processes are greatly assisted by higher oxygen tension in the lungs, and this is accomplished by adding to the air which the panting runner breathes, pure oxygen, or enabling him to take a few breaths of oxygen unmixed. But this is not exactly stimulation, and should it be called so because it increases the vitality by combating fatigue, it is stimu lation by just the substance which physiologically is

As a few authorities on the physiology of running, on As a few authorities on the physiology of running, on fatigue products, and on pathology of lack of oxygen, I may mention Zinitz and Schumburg ("Physiologic dea Marsche"). Lowey-Zuntz, Muller, Caspari ("Hohon-klimer," etc.), Verworn, Mosso, S Schrotter, Haldano ad Smith, Martin H Fischer Oxygen "intoreaction" is a layernan's expression, and seems to me midsedung for the numerous readers of your

seems to me insecuning for the numerous readers of your smentifically recognized paper. In the above sense we can speak of a "waste products intexcention" and of an oxygen "disintexcention."

Moreover, the difference between the physiological stimulant and any other stimulant is besides that the first stimulant and any other stimulant is nesdest that the nest is normally and at a normal fixed rate absorbed by the blood and the latter abnormally and at a non-fixed rate. I cite Nagel's "Pexthook on Physiology of Man," I 1, p. 84; Christian Bohr, "Blutgase und Respiratorischer Gas-"With increased tension (of oxygen) the increased absorption follows at reduced rates, and before atmospheric oxygen tension (in the blood) is reached an aumospheric cygen tension (in the blood) is reached an increase of tension has but little influence upon the absorbed amount of oxygen, at saturation with pure oxygen under a pressure of 760 millimeters red blood corpuselos absorb proportionally insignificantly more oxygen than at saturation with atmospheric air." And the ie, p 216 "When breathing gas mixtures enriched with oxygen or pure oxygen under atmospheric pressure at not excessively long periods, oxygen absorption and carbon dioxide secretion do not show important deviation from the normal However respiration of pure oxygen under a pressure of three to four atmospheres or respira-tion of ordinary air under a pressure of fifteen to twenty atmospheres acts quickly deadly, as has been shown by P Bert "

This of course is a condition which can only be produced in a laboratory by the necessary paraphernalia But the above should bear evidence that the runner who is under exygen starvation on account of the pathologic "fatigue" condition of his blood, and even a normal individual, whose blood should be of normal oxygen capa-ity, runs no risk in breathing pure exygen for a while, and that the word "intextation" is physiologically out of

place.

The immediate effects of oxygen inhalation are not felt by the reflectory nerves; in other words, pro sensation Any man who, in breathing oxygen at higher than aerial partial tension, feels exhibitated and like get-ting an "oxygen jag," is either subject to imagination or

the gas contains some impurity that produces the effect.

The soup or any nutriment which the runner consumes The soup or any intriment when our country consoners during the run I would, rather than oxygen, consider a stimulant or a tome. The effect which these produce is more in the nature of satisfying the secretive functions of the system than of supplying energy. The energy in such extreme strain depends on the body's stores. Water and oxygen are in my opinion the most needed factors in the maintenance of the energetic and respiratory functions of the system under extreme strain during a period tions of the system under extreme strain during a period of several hours. I am however puzzled by your refer-ence to "masent" oxygen. Has Sir Edwin really said so? I would conclude that we may consider oxygen a stimu-lant or the physiologic stimulant, a nutriment, an energy producer, a life sustainer, a corrective of depleted meta-bolism, or in general term, an invigorator—it is all that by nature of the physiology of organized life; but we should not consider it a drug or a dope, an intoxicant or narcotic, nor a danger, if pure and not dry.

I would deem it a favor if you will give publicity to this very brief outline on the rôle of oxygen in the case of the runner.

New York city Richard von Foregger.
[Most controversy is over terms and definitions, rather [Most confroversy as over terms and definitions, rather than over ideas Pure oxygen as a stimulant, in that it excites a diffused and transcent increase of vitality and energy. Stimulants are offentines "inducated" in dis-case, but the use of any stimulant beyond the body's physiological needs is intoxention ("jag" in the verancu-lar). A drug is a medicament ("dope" in the vulgates) pure oxygen is such in anemic come, lobar penimonia, etc. Pure oxygen is not a physiological stimulant, but atmospheric air (oxygen 20 + parts with nitrogen 80 parts) is a most salutary physiological remedy. Hydro-gen is not a physiological remedy, but hydrogen + oxy-gen (H<sub>1</sub>O) is Carbon (like H and O) is a constituent of gen (H<sub>1</sub>O) is Carbon (like H and O) is a constituent of the body, but it is not a physiological remedy. How-ever, C, H, and O in combination (as soup, for example) make up a physiological remedy. Phosphorus, sulphur, iron, are essential constituents of the body, but not iron, are essential constituents of the body, but not physiological remedies The editorial writer would re-state his main thesis that the drugging of Marathon runners (the race is of some 26 miles) with pure oxygen would tend to physical disaster, sooner or later, for the man thus stimulated beyond his natural powers; and would be most unfair to those competitors who depend frankly upon their own natural capabilities, adjusted to natural environment, for the victory. Lankoster is not responsible for the term "nascent oxygen;" the editorial writer used it in the sense of "uncombined oxygen,"]

# A New Use for Potatoes

# Raising Potatoes in Germany for Industrial Purposes

By H. C. Price

W THIN the last ten years a new in VV dustry has sprung up in Germany which has already become of large comwhich has already become of large com-mercial importance, namely, the drying of polatoes for stock food. This is done in polato-drying factories that are rapidly increasing in all parts of the empire How rapid this increase has been is shown by the fact that in 1997 there were but 118 such factories in Germany and last year there were 404 in operation, notwithstanding the fact that in that time the pointo crop of Germany was the poorest they have had for many seasons and the price unusually high

German Potato Crop.

Germany grows nearly five times as many bushels of potatoes as the United States They produce on the average two and one half times as large an area and the yield is twice as much per acre. In fact, only two other crops, those of rye and oats, surpass the potato crop in acre age in Germany In America potatoes are grown exclusively for human food, but not so in Germany; immense quantities are grown for industrial purposes and used for manufacturing starch and denstured alcohol and for drying, all of which are important industries. The market quota-tions are given regularly for potatoes for eating purposes and potatoes for manufacturing purposes and the price of the latter, as a rule,, is about two thirds that

Much attention is given to breeding potatoes for starch content and experiment stations are maintained in the various provinces to test the different varieties for yield of potatoes, yield of starch per acre, as well as per cent of starch content. The test this past season of one hundred and twenty-five varieties, showed a variation in the per cent of starch content in the different varieties grown under the same conditions of from 12 per cent to 25 per

The Germans have paid particular at tention to developing the starch content of the potato in order to increase its value for manufacturing purposes and in doing so frequently lose in size of tubers and yield per acre.

Development of the Drying.

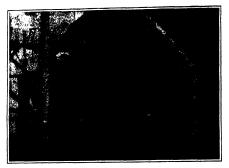
The development of the pointo-drying industry has been the result of over-production and low prices. With such large areas grown, as is the case in Germany in of good crops there is a large overproduction. In such years formerly the farmers were obliged to accept rulno low prices for their crops and were at the mercy of the potato merchants. The po-tato being perishable, it cannot be carried over from one year to the next as is the case with grains. It is easily frozen and when once frozen is ruined, so that the disposition of a surplus in a good crop year was a serious problem

For some years the Germans had been drying the sugar beet pulp from the sugar factories (after the sugar had been tracted) and using it as stock food gave rise to the suggestion of using the surplus potatoes in the same way. This would not only utilize the surplus but would preserve it in a form in which it could be held indefinitely and stored with-

out danger of freezing. It would also take the surplus off the market and insure a reasonable price for the rest of the crop

The government and the agricultural organizations offered large prizes in the latter part of the ninctles for the most successful methods of preserving potatoes, both for human and stock food. As a result a large number of methods and kinds of apparatus were offer so that it can be said by 1900 entirely successful methods had been perfected

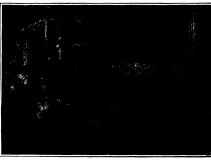
There are two types of drying apparatus on the mar-et. The one produces the so-called potato "schnitzel,"



Apparatus for manufacturing flocken.



A potato-drying factory in Germany.



One type of potato-drying machinery.

which is made by shredding the raw potato into pie about as thick as a small lead pencil and drying it under very intense heat. The other produces what is known as potato "flocken" flakes. In this latter method the potatoes are first cooked by steaming and then mashed and dried by passing between hot rollers by steam. Since the rollers are placed near to one another the times passes between like a sheet of paper. The heat causes them to adhere to the exterior walls of the rollers and the motion is so regulated that they are com-pletely dried before the rollers have half completed the revolution Two knives on the outside of the rollers cut off the dried mass, which has a bright yellowish-

white appearance, a good smell, and forms a coarse sort of potato meal. In the drying of the raw potatoes, the shredded pieces are first exposed to very great temperatures, often as high as 1,000 deg. Cent (1.882. deg. Fahr.), as they are carried slowly through a long chamber e temperature constantly decreasing. When they go into the drying chamber as raw potatoes they contain 75 to 80 per cent water, and when they come out as the dried product or "schnitzel" they contain 12 to 15 per cent water. In the manufacture of the flocken such high temperatures are not necessary, as the po-tatoes are first cooked, but when finished they contain approximately the amount of water as the schnitzel.

The amount of raw potatoes required to produce one hundred pounds of the dried and dry substance in the potatoes used, as and dry smoother in the potenties used, as well as upon the amount of moisture con-tained in the finished product. The fol-lowing table shows the amount of dried potatoes, either as schultzel or flocken, containing 15 per cent moisture that can be produced from potatoes of different

Amount of Raw Potatoes Required to Produce 100 Pounds of Dried Potatoes,

Containing to Fer Cent Mountare,								
and	When T	ien.	Contain					
Cent.	Per	: Ce	nt.	Lbs				
tarch	17.8 đ	ry 1	natter	480				
**	19.8	••	**	460				
**	21.8	**		390				
**	23.8		"	360				
**	25.8	"	**	830				
**	27.8	••		310				
**	20.8	**	**	290				
	and Cent. tarch "	and When Ti Cent. Per tarch 17.8 d " 19.8 " 21.8 " 28.8 " 27.8	and When They Cent. Per Ce tarch 17.8 dry r " 19.8 " " 21.8 " " 23.8 " " 25.8 "	and When They Contain Cent. Per Cent. tarch 17.8 dry matter 19.8 " 21.8 " 23.8 " 25.8 "				

Use of the Dried Potatoes The dried potatoes, both schnitzel and flocken, are used as food for horses, cattle, sheep and swine, and have come to be an important product on the market and are regularly quoted in all market reports. The potato flocken is preferred, as it is more digestible, and of the 404 factories in operation last year, 314 were equipped to manufacture flocken. That may be due in part to the fact that it does not cost as much to install an apparatus to manufacture potato flocken as it does to manu-facture schnitzel. On the other hand, after the equipment has been installed, the potato schnitzel can be manufactured more cheanly than the flocken. The Germans count that it costs \$1 to \$1.50 per ton of fresh potatoes to dry them in the form of schnitzel and \$2 to \$250 per ton to dry them in the form of flocken.

Although dried polatoes may be used for all classes of livestock, as a matter of fact, they are used principally at the present time for swine. Experiments and practical experience have proven that dried potatoes may be used almost entirely to replace corn in the ration, and this is of decided tage to Germany, since all the corn that is us d has to be imported.

Advantages of the System.

The extent to which potatoes are dried from year to year for stock food depends upon the crop. In years of over-production the surplus is dried and thus put into a form that can be preserved for an in-definite length of time. By drying the

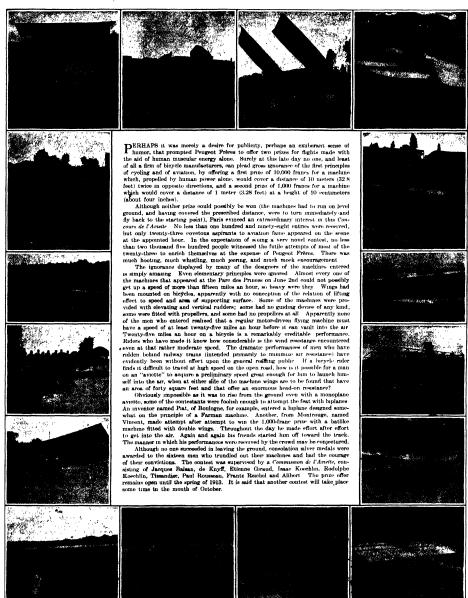
are saved from rulnously low prices surplus the farmers for their crops. In years of short crops, such as last year, it is used principally to utilize the cuits and po-tatoes that are not suitable, for human food. The dried potatoes are not only in a form that can be stored with-out danger of frost and for any length of time, but the weight is reduced about three-fourths, so that the cost of transportation is reduced in like proportion, and surplus in one section can be shipped to other sections

surplus in one section can be snipped to oncer sections of the country without great expense.

The system has passed the experimental stage and has taken a permanent place in the agricultural manu-facturing industries of Germany.

# The Failures of the "Aviettes"

Impossible Performances for an Impossible Prize



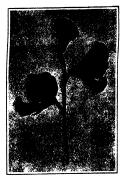
A French firm of bleycle makers offered a prize of ten thousand france (two thousand dollars) for a flight of ten meters (32,8 feet ) made with human muscular energy alons. One hundred and ninety-six machines were entered, of which twenty-three were actually constructed. Not one of the machines was able to get off the ground.







Horse-tail or scouring



Common sweet pea.



A tip of one of the Indian hemps with fib rous bark and milky juice (Apocynum).

# Preserving and Mounting Plant Specimens

#### II D. .... I II. C. l. F. Cativola Had

How Pressure and Heat Can be Effectively Used

By Clara Reese

A SIMPLE and effective method of preserving plant dependence has been discovered. The process be likely to resolutionize the present slow and laborious preparing and mounting of herbarium collections. As a matter of scientific experiment the lobational department of the University of Pittsburgh, Pa. Is giving the

new process a tital. The plant spectmens to be mounted are brought in fresh and moist from garden or conservators. These are subserted to a forced process of driving which preserves the nutual colors of stein, leaf and those? After this they are indeedled, or liddle, on a viciding surface such as blotting paper, curriducert, slik, woden or rubbertzed material, and when fluidsed present the smoothness and exemises of a pluiding.

In demonstrating the process for ne the inventor invited in the front in plantose plant in the presence of the active. This ten's was find smoothly on an ordinary price of blotting paper. The lotting paper in turn was fail on a small steel plate neither much larger in turn on much this certain a for course measure. Several one much this certain a for course measure. Several near the whole laid upon the plate of an ordinary toggle press of hand leverage. A few steel plate were thrust in upon the blot ters in order to build up the material to a thickness to make the requirements of the press. Hefore applying the leverage, heat was introduced into the bed plate to means of a small place and a stopcock. The lever was forcest down by hand, and at the expiration of thirty-with the plate, and the divid specimen was removed. It showed its ordinar freedoms, while the heat bath it received, somewhere about a temperature of 200 deg.

By homeesing the cord in cold water for an instant, the dried leaf slipped easily from the circl. It was then hald upon the sheet to which it was to be permanently mounted or linked. Practically the same process in the logic pross for the permanent mounting was gone through with though "arms" were adjusted to the lever in order to give a higher degree of pressure and less heat was turned on in the bed plate. The fuventor gives the conjected specimens a flual wash of Highd celluided and alcohol as a protection to the same in case of rough handling.

The discovere of the process is William Heeren, who so spent most of his biform as a skilled northern in precluis metals. Mr. Heeren, appeared before the horizontal Society of Western Pennsylvania at a recent meeting and exhibited many of his imbedded specimens. As yet be has not succeeded in the thinking of the natural plant in a ground of silver or gold, but he claims perfection so far as a yielding surface is concerned. He has hundreds of specimens and has sail jected those to severe tests to prove the preserved colors as herting and the habid growth as practically indicated the specimens are letting as

Mr. Heeren has kept his finished specimens under water for a week at a time and has lifted out the cards with their inlaid growth still unimpaired. He has imbedded his leaves and flowers in celluloid or transparent ground and hung them for months in the window in the studight as "transparencies". He has used his mountings as decorative lamp shades and as studes for electric bulbs and after a heated test of six months or more of household and offer oration use, the roses, junises, violets and forms are as bright as ever in their first color. Others are hung where they are subjected to atmospheric changes.

This experimente is equally successful in imbedding specimens whether of thick-stemmed and woody variety or of the most defeate and feathery of plant growth as habid clumps of moss and corsage bounted to violets, and he has finial the delicate tracery of asparagas when and the dainty petal of a rose. He has habid he do grain, princess feathers and specimens of cuttail, and he has likewise inhifd the othereal quaker high, the sweet pea and wood viole! There has really been no limitation in his experimentation, and sprays from bridal bouquest find themselves inhedded in small bicess of celluioid as ready for mounting as brooches and buckers.

A floral bett has a place in the experiment collection, in this hashney the nose rose inds have been imbedded in a duratic yielding strip of material. As the strip came from the hydroulic pressure, a crysted ribbon of rich quality was hald over the strip and the whole of the quality was hald over the strip and the whole in through a rollor. The ribbon was then present our markins. Many duinty "trimmings" of shear material and either fabric have their imaging of electate flower or vining. All Heeren has not confined his experiments exclusively to joint growth, but interfrits and brilliant-hard insects are included in a hosting manner. A most perfect and rich specimen of a peace-of-k feature

Is limited on a black tribber panel.

Mr. Heren is not a botantia and will likely develop
his discovery along ornamental lines as sultrible to his
erritamodals. His workshop shows the ornamental
trend in the grouping of biossoms and colors and does
for faus, handbase, girdles, gift cords, brocches and
brokles, likewise lump shades and transparentess. The

possibilities in these lines are endless
Nevertheless, Mr. Heeren is making a herbarium by
the usual process and is mounting specimens of plant
growth the old way as a comparison with the new
method. By the old plan the specimens need carefully
arranged on bibliousy paper, and pressed between smooth
boards by putting weights or using a screw press. The
paper is changed every day or two as the plants part
with their moisture. When the process of essecution
is complete the specimens are fastened on sheets of
paper by gument strips. To protect these cried brown
specimens from the ravages of insects, camphor is rerecord reconcertly in the relative type.

In his demonstration before the Botanical Society, Mr. Herere contrasted the two methods and showed how the new way, in the hands of botanical experts might bring a practical herbarium within reach of the ordinary class room without danger of mounted dried specimes breaking losse from eards or of destruction by insects The "wash" given the iniaid cards preserves the specimens from inroads of insects. He showed how science might utilize the method likewise in a systematic arrangement for a large herbarium.

Mr. Heeren showed also how outlines might be printed

Mr. Herero showed also how outlines might be printed for the youthful hotanist to properly color. He deftly lifted an inlaid specimen out of its tight had and showed how the matrix or impression might be used for printing an outline out drawing paper. He has examples of this outline printing as necurately defined as an engraving. In the hands of the skilled botanist, the inventor says, there is no reason why plant and flower, should not be preserved in natural color and desired arrangement with nuch less waste of time, labor and space, than at present.

Mr. Herevit discovery is the further development of an idea of his worket is now classed as a successful invention, namely, the celluloid tage or number plates seen eters where on the case or coats of expressmen, measurements, porters and others in uniformed service. As the numbers are necessarily invented as quick process. These smooth white dissertly inside it a quick process. The smooth white dissertly inside it a quick process. The smooth white dissertly inside it a quick process. The smooth white dissertly inside it a quick process. The smooth white dissertly inside it is neglectal factory under the supervision of the inventor. The curvet plates for the process of shaped one counted only in the fact that the process of shaped one counted to the plate in the state in every land and introduced binself in locatarities, Egyt, by removing one from the cap of a porter and pointing to the firm name and address on

#### The Practical Use of Seaweed

Call N. kinds of seawed are used in the construction of Japanese bisingless, or agar-agar, the method of manufacture being described as follows in a recent U. S. Consuliar report: The seawed is fart crushed, each kind separately, to remove shells or other adhering matter, and then washed clean with water. The washed seawed is placed on a mat and dried until to solor becomes white by the action of the sun. Trost, and dew This operation takes place during September and October, and when bleached the weight of the seaweed is decreased nearly one-half After bleaching, the six kinds of seaweed—in the proportion of Izu, 4: Egokusa, 4: Maukt, 3; Hirakusa, 3; Nanhu, 4; and Colkinsa, 2—are all put together in a buller and cooked for about 14 hours, until they have become soluble for about 14 hours, until they have become soluble into a container. From the container the liquid is indied into trays and the container the liquid is indied into trays and and the issuigness is cut into a container. From the container the liquid is indied into trays and, and the issuigness is cut into a trips 3 inchess wides and 1 therels you, with a knife and ruler. These strips are then put into a long closed strips 3 inchess wide and 14 thenes long, with a knife and ruler. These strips are then put into a long closed me attys. The tsingsies is then placed on a low stand, which is covered with a clean mat, and dried in the sam and quised through the sieve and in the form of tong the strips. The tsingsies is then placed on a low stand, which is covered with a clean mat, and dried in the sam cut in the form which is covered with a clean mat, and dried in the sam and placed through the sieve and in the form of one stand, which is covered with a clean mat, and dried in the sam and placed through the sieve and in the form of one stand.

and the same of the

# The Laboratory

#### Some Suggestions for Home Experiment

#### Experiments With High-frequency Currents Ry Philip Edelman

100 CONT. VIII. VI

THERE IS 9 NHERE is parhaps no one piece of apparatus so interesting as a high-frequency or Tesla coil. With the laws-oof electricity are apparently violated. accessing of voits are taken into the body with no asant effects, lamps are lighted without connecting



Fig. 1. -The completed coil.

me conductors, and various other wonders are accomplished. There is no end to its won ers, and yet it is a comparatively simple piece of apparatus.

There are two general types of these colis, the oil-immersed and the open-air kind. For performing the following experiments the latter type will be described, as it is much simpler and accomplishes the same

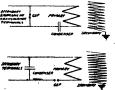
The secondary of the coil is wound upon a paper or fiber tube 10½ inches in diameter and 10½ inches high. Beginning ½ inch from one end, wind 80 turns of No. Segming by mas were upon this tabe. Wind this wire on very carefully, spacing each turn 8/82 of an inch apart. About 1/8 pound of wire will be needed. Give the finished secondary several coats of orange shellac, allowing each coat to dry before applying the next. The ends of the wire are fastened to the tube by punching two holes in it and sewing the wire into them.

For the primary winding, form 7½ feet of No. 4 rub-ber or weatherproof covered wire into two turns 13 inches in diameter and as near to a perfect circle as possible The complete coil is shown in the photograph, Fig 1.

The accessory apparatus necessary are: a 4, 4, or 1 kilowatt transformer or large spark coil, a large con-denser, gap, etc. The transmitter of a wireless station will just about conform to these requirements. coll will work to some extent even on a 1-inch spark coll. It gives a 3 to 5-inch spark on 1/4 kilowatt. according to the adjustment

Two methods of connecting the coils are shown in Fig. 2, an alternative form being given in Fig. 3 success of the coil depends on the adjustment must have the right amount of campacity (condenser) and the right length of spark gage or you will get but poor results. You can only determine this by trial. After you have found the right proportions and the coil

is sparking well, you are ready for the experiments. Ground the lower terminal of the coll and clos the switch controlling the spark coil or transformer Now bring your hand near the top of the coil. experiments are best done in the dark. Before you bring your hand near the coll, the top of the secondary glows with a beautiful corons brush. I have seen this done with a li-kilowatt outil. Snake-like twisting sparks shot outfrom the top, You may be able to see these on a small scale. As your hand approaches, a beautiful blue brush forms between it and the coll. The color intendisce untill—"Outh" A spark jumps to your hand and stings you. Now hold a pair of pilers, screw-driver or any metal tukes in your hand and repost the experiments are best done in the dark. Refore you driver or any metal piece in your hand and repeat the



experiment. This time the spark jumps to the metal and then into your body. If you are using less than 1/4 kilowatt in the coil you will not feel any pain; 1/2 watt will sting a little

You may wonder at this. You know that if this had en an ordinary spark at low frequency it would have been a terrible jolt, if nothing worse. Roughly counting 15,000 volts to the inch, you can readily calculate what you have just had through your body. But high-frequency currents, unlike low-frequency currents, travel on the outside of a conductor, and do not penetrate the inside The current travels on the outside of your body, and does not penetrate to your nerves. The sting you felt was caused by the heat

After you have become accustomed to taking this spark, grasp an incandescent light bulb in your hand, as shown in Fig. 3, and bring it to the top of the coil Sometimes in doing this the filament is jerked to pieces. An 8 candle-power lamp works best. The filament lights up Try the lamp on the middle and also near the bottom of the coil The lamp lights up brighter near the bottom than on top. There are numer-





iments with burnt-out bulbs and lighting a match Fig. 4.—Experim

ous variations to this experiment For instance, two lights can be lighted, as shown in Fig 3.

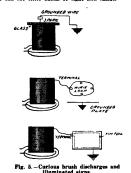
Now grasp a lamp by the built (it may be a burntout lamp) and allow the spark to jump to the capped Little webs of sparks will form and the filament will dance around The filament may get red hot The bulb is now charged and if you put your other hand on the cap you will get a good shock. The may be discharged to some one else, the ground or any conductive body.

any conductive sody.

Holding a burnet-out bulb by the cap, bring it near to the coll At first it lights up a pearl green. Next bring it very close for a second, allowing the spark to nuncture the glass, when it will turn a pink color, and then of you continue a while longer it will turn a purple color. While it retains this purple color it is quite nsitive, and lights up if held in the hand a few feet away from the These effects vary with every bulb used. Sometimes exceptional effects can be seen, while at other times nothing extraordinary hap-

Geissler tubes held several feet away from the coll light up bril-liantly. They are real wireless lights because there are no connect-ing wires. You can trace the lines of force to a slight extent by chang-

ing the direction and position of the tube and noticing the change in the brightness of the tube. A strange effect is shown by Fig. 4. Your hand and the tube form another secondary of the coll. Besides the tube's lighting, little sparks pass from the hand to the tube If you vibrate the tube backward and forward rapidly, can see little bands of light and shade.



You remember the burning sensation of your first spark To prove that this spark is very hot, you can light a match by it. It is best to use a pair of pliers for comfort You can burn wood, paper, light a candle for comfort 100 can ourn wood, paper, ngar a cannow and powder in this same way. Try the experiment with these materials, as shown in Fig. 4.

If a glass plate is laid on the coil as in Fig. 5, the spark will seem to pass right through it. But the glass

spars will seem to pass right through it. But the glass is not pierced, instead the spars is transferred to the other side of the glass by condenser action.

By forming loops of various shapes, as in Fig. 5, you

can get some very pretty brush discharges from your coil A name sign, Fig 5, is prepared by coating one side of a glass plate with tinfoil and the other side with the name, formed with fine wire. A terminal of each side of the coll is connected to the plate and the name respectively.

#### Some Experiments With Blue Glass By Prof. Gustave Michaud, Costa Rica State College

OMMON blue glass owes its color to the presence of colonit. It is transparent for the two extreme regions of the spectrum, red on one side, blue and violet on the other. It stops most of the central spectrum, i. e., orange, yellow and green From that point of view especially, it is altogether different from the yellow and red glasses used in photography and for which the absorption spectrum is unilateral. That the cobalt glass allows the free passing of the extreme red is by no means evident at first sight, and it seems as if only pure blue light were admitted. In the extremely simple experiment described here the red light admitted with the blue and violet is caused to stand away from both and thus becomes visible. periment is probably the only one in which an absorp-tion spectrum can be distinctly perceived without prism, diffraction grating or apparatus of any kind

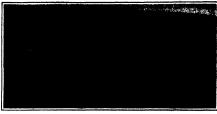


The eye used as a spectroscope.

# Inventions New and Interesting

Simple Patent Law; Patent Office News; What Inventors Are Doing





A new gun for use on scroplanes.

#### The Lewis Gun for Aeroplanes By William Joseph Wheatley

WHEN an aeroplane soared aloft from the Army Aviation School at College Park, Md., the first part of June, carrying new rapid-fire gun, the invention of eutenant-Colonel Isaac N. Lewis, of the United States Army Coast Artillery Corps, machines left the realm of air scouts and from that time forward became active engines of war for both offensive and de-fensive work The possibilities of the new gun were realized when the aeroplane came down after Capt Charles deForest Chand-ler, commandant of the school, who manned the gun on its air trip, had discharged a full magazine of fifty cartridges, and an exami-nation of the target had disclosed the fact e forty-five shots fired had buried themselves in a space three yards by eigh-The white target of cheeseeloth ired three yards by fifteen, and while a number of shots had preced the cheese cloth, the greater part were bunched just off the end. Five of the shots from the magazine had been sent into a fishpond on the reservation in order that Capt. Chandler could get, by the splash of the water, ar instantaneous report of the accuracy of

The seconlane driven by Limitenant Thomas DeW. Milling, one of the army aviators, was humming through the air at approximately fifty miles an hour, and at an altitude of 600 feet, when a ripping sound heard above the roar of the engine told that the gun was in action. Twice again the aviators flew over the target until magazine had been exhausted. fact that this was the first time the gun had been taken aloft together with the trueness of the aim as shown by the examination of the target spoke emphatically then and there of the great possibilities of fleets of aeroplanes loaded with these rapidfire guns, soaring over a column of the

No smoke, no fisme -only the sound of the explosion tells that the gun has been fired. There is no recoil and the gun is so balanced by the magazine that the aim is not even interrupted while the gun is being fired. It can be fired at as high a rate as 750 shots a minute, but the rate may be reduced to 350 shots per minute, or to any number bowen those limits, by a simple adjustment of the gas-port valve controlling the admission of the gas to the

The principal and most novel feature of the gun is its air-cooling system. The 36 caliber gun barrel is surrounded by a close The 30fitting aluminium incket, cylindrical in and having some twenty deeply longitudinal grooves which extend from breech to muzzle. The gun barrel with its grooved jacket is inclosed in a light steel tube 3% inches in diameter, the portion of tube 3% inches in diameter, the portion of the tube which projects beyond the muzzle having a reduced diameter of only 2% inches. The inclosed grooves, forming continuous ar duots in the aluminium jacket \*hroughout its length, have free

breach and each time the gun is fired the ejector action of the discharge blast sucks in a draft of gool air from the rear through these ducts, thus carrying off the heat transmitted to the jacket from the barrel. cooling is automatic in action, without the use of water or other cooling liquid and without mechanism or moving parts. aluminium has six times the heat cor tivity of steel and but one-third its weight. very effective method of cooling gun adds but a few pounds to the total weight carried. Another novel feature which differentiates the Lewis gun from all other gas-operated guns is the small malosed operating spring which is located near the trigger-piece at the breech far near the trigger-piece at the breesh lar removed from all injurious heat effects. The temper of this spring cannot be af-fected by either direct or transmitted heat no matter how rapid and long-continued the firing.

When firing at full speed it takes approxi mately four seconds to discharge a mage zine of fifty cartridges, and the empty magazine may be replaced by a full one within two seconds The drum magazine used with this gun is 8½ inches in diameter and 1½ inches deep—It is stamped from and 124 inches deep 1t is stamped from sheet steel, has an aluminium center proce to hold the cartridges in plass and resem-bles, somewhat, a reel used for winding cinematograph films.

nematograph films.

Colonel Lewis designed the gun primarily for infantry and cavalry use, but its flameless feature coupled with the absence of recoil and its light weight brought to mind the possibilities of the rifle for aeroplane use, and a test was decided upon with the success already noted.

The development tests of the gun, which

have been in progress for the past two years, show that the barrel does not become

communication with the atmosphere at the | overheated under continuous fire at full speed, and that it will not therefore be necessary to carry along an extra barrel when on the firing line. Since no cooling water is necessary, and no special mount except a small stake or "cow-boy" mount weighing about eight pounds, the field equipment of the Lewis gun is reduced to a minimum. The gun may be fired from any natural support found in the field such as rock, log, stump, tree or mound of earth It is even possible to empty a magazine while holding the gun to the shoulder or from the hip, as the recoil effect is very

> It is a matter of note that one of the most uous things on the battlefield in South Africa was the jet of steam from the boiling water which was being used on the barrels of the rapid-fire guns for cooling

> Weighing as it does a little more than twenty-five pounds and requiring but one man to operate it, Colonel Lewis' invention has certainly made a great stride toward developing the aeroplane into a first-class

The gun is simplicity in itself. It has only forty-seven parts, as compared with twice that number for other rapid-fire twice that number for other rapid-fire guns. On the battlefield or in the air where tools are necessarily scarce, and where they are needed more than anywhere else when they are wanted, Colonel Lewis' invention would certainly cause no worry, broken or otherwise get out of working order, since the only tool required to dis-assemble or assemble the gun is the point of a bullet.

The sustained rapidity of fire the gun is capable makes it a far more dangerous and effective weapon than any bomb-dropping device as yet davised.

As soon as a new machine is delivered As soon as a new machine is delivered to the Signal Corps to replace the flier which was wrecked recently, further and more complete firing tests of the Lewis gun will take place at College Park. It is proposed to carry the gun and one thousand rounds of service ammunition to heights of 1,000 feet or more and fire at sele and the second termine the accuracy of fire at different heights and speeds. The results of these firings will no doubt have fareaching effect upon navy and coast defense plans for the future. However, with rense plans for the future. However, with the results already obtained in view, it seems only a question of Congressional appropriation to decide whether or not we are to keep the lead in aeroplane arma-

ment.

Another question brought up in connection with the possibilities of this gun is its ability to attack the men on the decks and in the fighting tops of battleships. Battleships of the future, of course, will be equipped with hydro-seroplanes for soouting purposes and even, possibly, to report the gun ranges of the enemy. Should these hydro-seroplanes each be equipped with the Lewis rapid-fire gun they would play havoc with the range-finders telephones, lines of communication and the personnel in the fire-control masts such as personned in the introduction makes such as those with which the battleships of the United States are equipped. It would mean that the men who direct the fire of their guns from these fighting tops will have to be protected. Some form of overhead protection will undoubtedly be nee sary to protect the fire-control personnel, and naval officers of the various bureaus are, it is said, much exercised over the possible effects of attempting such pro-

izetion. The gun made a very successful demonstration of its possibilities as a service weapon for the mobile army at Fort Myer, Va., recently, before Secretary of War Stimson, Major-General Leonard Wood, Chief of the General Staff Copps; Brigadier-General William Cronier, Chief of the Army Bureau of Ordnance; General Erasmus M. Weaver, Chief of the General Examus M. weaver, these or one Coast Artillery Corps; Brigadier-General, and Brigadier-General E. H. Crowder, Judge-

The men who tried the gun.

The gun in use from the ground.

A \$10,000 Prize for a Practical Sugar Beet Puller and Topper

THE Great Western Sugar Company of Denver, Colo., has offered a prize of \$10,000 for a practical sugar beet puller and topper which shall fill the specifica-tions given in a circular published by the company and which may be obtained by the of charge on application to the company. From this circular we glean the more salient

From this circular we gican the more satisfi-conditions as follows:

The best puller and topper must fulfill the required specifications to the complete antisfaction of a committee of judges ap-pointed by the company.

The offer may be in force until the first day of March, 1915, but the prise may be

d at any time prior to the first of 1915, when a practical best puller Moreh, 1915, when a practi and topper is forthsoming.

or more contestants fulfill all the red conditions and specifications, the sequence conditions and specifications, the originities of judges are to exercise their sole discretion and are to award the prize to khe one who in their opinion has solved the problem most practically.

the problem most practically.

The contestants will be required to demonstrate their machines at such times and places as the committee of judges and places as the committee of judges and designate. The contest is open to the general public including the employees of Great Western Sugar Company, and of all

sugar companies.

The Great Western Sugar Company by awarding the prize will acquire no interest in the invention, design or machine of the ful contestant.

successful contentant. The motive power required for different soil and wassiber conditions must not be exceeding that is, it must not exceed four horses per best own; if animal power is used. The device must pull and top all the bests and esparate best and tops, and leave the bests and tops. and leave the bests and tops convenient to load. It is beets and tops convenient to load. It is especially understood that the work may be done by two machines, of which one does the topping, the other one the pulling or vice serse, although a combined machine is preferred. The pulling and topping must be done in a satisfactory manner. The best puller and topper must be adjust-able for rows spaced from sixteen to twenty inches apart. Damage to the beets of tops must be avoided as much as possible. The selling rote of the machine to the

tops must be avoided as much as possible. The selling price of the machine to the public by the local dealer, whether combined or otherwise, must not exceed \$500 if the motive power is animal power and must not exceed \$500 if belt-propelled.

#### Argental-A New White Metal A Competitor of Silver.

A METAL or alloy, of very high-class qualities, has recently been evolved, after many years of research and experi-ments, by William A. MoAdams. This new metal will be named "argental," be-cause it is an alloy of silver and aluminium, the affinity of which is produced by chemicals and rare minerals, and it is par excel-lence as a substitute for silver having all

its qualities except weight.

Argental has been produced to compete
with silver, and for general manufacturing
and industrial uses it is in many ways far superior to silver for the reason that, being alloyed with aluminium and cast by means of a patented compound and molds, or of a parented compound and mous, or dies, it has many times greater strength than either silver or aluminum. It is white like silver and not leaden or blue

The silver in its composition prevents the aluminium from being attacked by ordinary alkalies, and the aluminium preordinary alkalies, and the aluminum pre-vents the silver from being attacked by ordinary acids. The alloy cannot be affected by nitric acid, and it will not tar-nish or oxidise, by exposure to the atmos-phere or games. It as pecific gravity is only one third that of silver, and consequently three or four times the quantity of manu-factured articles can be produced from the eight as that of silver, such as watch cases and movements, forks, spoons, belis, tableware, ornaments, hardware special-ties, typewriters and similar machines, not mentioning a number of other incidental

Comparing argental is weight with other metals, we find that it is one fourth the weight of copper, one fifth that of iron, onefourth that of gold, and one sixth that of

The alloy can be cast, die-cast, rolled. spun, drawn into wire, milled, engine-turned, and turned in the best manner and et of threads out on it. It takes a fine polish.

This metal is simply pure silver, alloyed Ansi mesa is simply pure silver, alloyed with aluminium by means of elemicals and rare minerals. In the case of argental, the silver is alloyed with aluminium, in order to preduce a neutral metal, which is proof against ordinary acids and alkalies, and also to oral preset travershi and illess, o to gain great strength and light-

#### Notes for Inventors

A Bread Wrapping Machine.—In a re-ent issue of the Scientific American we cent sense or use SCIENTIFIC AMERICAN we stated that a machine was needed for wrap-ping bread in suitable paper. We are in receipt of a letter from the National Baker, of Philadelphia, informing us that such hines are well known.

A Packard Automobile Invention.—The Packard Motor Car Company as assignee of Russell Huff of Detroit, Mich., has issued stent No. 1,029,063, for a motor vehicle in which guards at the sides of the body extend to the rear of the body and a license plate is mounted on and directly above the plate is mounted on and directly above the rear extended part of one of said guards while a lamp is mounted on and directly above the extended part of the guard with one of its lenses fashing the license plate so that the rays of light from the lamp will fillumingste the license plate.

tituminate the license plate.

Two Hudoon Maxim Patenta.—Mr.
Hudoon Maxim has secured two patents,
Nos. 1,028,472 and 1,028,475, for vessels of
war. The vessel presented in the first patent has two oppositely disposed longitudinally extending water compartments
for its immersion with inlets and outlets
leading to the front and resar respectively. and a propeller in proximity to the rear outlet; while the second patent is for a torpedo boat consisting of two hulls united longitudinally end to end with a war head ed by the forward hull and an auxiliary explosive head carried at the front of th

nishes.—In a patent, No. 1,029,223, issued to the Ohio Varnish Company of Cleveland, Ohio, as assignor of Walter R. Rae of Chicago, there is presented a demonstrating machine in which is combined means for machine in which is combined means for automatically performing repeated cycles. These cycles include the application of the material such as varnish, the manipulation material such as varian, the manipulation of such material, such for instance as to produce an effect illustrative of graining and then the automatic obliteration of the graining so that the apparatus can repeatedly produce to the eye the effects of the eary produce to the eye the energy of the application and manipulation of the ma-terial in order to permit its use in advertus-ing a particular material.

Rose Horseshoes .-- An industry which Rope Horseshees.—An industry which might, it seems, be developed to advantage in this country, is that of rope horseshoes. These are largely used in Germany and some other foreign countries and should ind favor here because of the large mileage of paved streets in most American city The rope portion is inserted in a metallic body or frame and in most instances prorection is made for withdrawing a worn rope section and replacing it with a new one. In some instances the rope which is sometimes tarred has wire or other reinforcing material interwoven with it. Berlin is the headquarters of a syndicate composed of eight manufacturers located at different points of Germany. Possibly the practical development of the industry in this country would necessitate the modification of the shoe either in its metallic or rope portions or both to adapt it to local conditions.

Activities in Inventions. — Activities slong certain lines of inventions result from various causes. Sometimes the demand creating the activity is local, at other times creating the activity is local, at other times, it is universal, while it is, at other times, produced by some peculiar condition calling for special results. Thus the large number of apartment houses has led to the activity in the class of automatic fire recorders for indicating the precise location of a fire within the area covered by the or a me within the access overed by the apparatus. Automatic telephones have experienced an impetus from the installation of phones in small series which do not warrant the expense of a "helio girl" exchange. Local conditions in California. change. Local conditions in California and Colorado, those great reserts for con-sumptives, have contributed largely to the insistent demands for antiseptic mouth pleose for telephene treasmitiers, many patents for such devices eventualing from applications filed from such States. This offers a field for investion which is prac-tically as unlimited as that for individual drinking sups.

#### Legal Notes

cent Adjudicated Patents. -Out o secont acquiested resents.—Our or five adjudicated cases reported in the Pat-ent Office Official Gazette of June 4th, 1912, only one patent was declared invalid. This was the design patent to Boldt, No. 39,921, for a bottle, and the U. S. Circuit ourt of Appeals held this patent void on face for lack of patentable novelty and invention. In the other four cases, three were held not infringed and one, the Truffault Re-issue patent, No. 12,437, for a shock absorber for vehicles, was held valid and infringed.

A Process After an Apparatus Interfer-ence.—In deciding ex parte Gold, Assistant Commissioner Billings referring to the ques-tion of res adjudicata said, "it is perfectly apparent that if the claims state merely the adjusting of the device so as to operate it in the way in which it was designed to be operated they are not separably patentable from the machine itself—in other words, that they are but different statements of the inven-tion defined by the apparatus claims. It, therefore, follows that the judgment in the prior interference is a bar to the all prior interference is a bar to the allowance of any claims the alleged method of which could be carried out by the apparatus in issue in that interference."

Securing Benefit of Foreign Application —In the case of ex parte Barthels, Assistant Commissioner Billings has held that "Where an applicant claims the benefit of the filing of an apphoanon me country for the purpose of overcoming a reference, his affidavit, filed under the provisions of Rule 75, should be accompanied by a copy of the original foreign application, certified to by the Patent Office of the country in which it was filed, and if it is not in the English language, a sworn transla-tion of the same or a translation made by the official translator of this office. If the application was not made by the inventor himself, applicant's affidavit should also country was filed for his benefit and that such procedure is in accordance with the procedure in the foreign country."

procedure in the foreign country.

Concealment of Invention.— Asst Com
Tennant in the case of Quenzor v. Callis
again indicates the danger of concealing an
invention in the event of a contest arang
as to priority. In this case the Board of
Examiners in Chief held that in view of C's concealment of the invention, he had for feited his right to a patent, and the Assist ant Commissioner in affirming the decision of the Board quotes portions of the decision of the Court in the case of Warner v. Smith, 84. O G., 311, including the following: "Can one who has made an invention and who has locked it up in the secrets of his own exclusive knowledge and who pro-duces it only when some rival inventor has entered the field be held to have acted in rdance with the policy of the law or with the spirit and purpose of the consti-tutional provision? Such action, or maction, as we might more properly term it not only contravenes the interests of the public, but also operates to injure the rival inventor who in the meantime enters the field of invention."

A Marconi Decision.—Mr. Chief Justic Shepard in the Court of Appeals of the District of Columbia has held that "When after the termination of an interference the after the termination of an interference the losing party presented claims which were necessarily included in the scope of the decision in the interference and concluded thereby, it was the duty of the Commisgloner to reject such claims.

The facts in this case are stated to be as

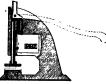
"M filed two applications disclosing dif-TM fied two approaches disclosing dif-ferent species of the same invention; but in neither of them was the invention claimed broadly. After the declaration of the inter-ference between the later application and ference between the later application and effects means for bunding the spring by while an application of B, a patent was granted on the earlier application. The interference was desided in favor of B, and there steem was desided in favor of B, and there steem was desided in favor of B, and there steem was to be steem to be stee

RECENTLY PATENTED INVENTIONS These columns are open to all patenties. The notices are inserted by special arrangement with the inventors Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Of Interest to Farmers.
PLOW AND CHOPPER C. P. Branss,
Route 9, Carcellion, III. The aim in this patent
is to provide a machine especially designed for
plowing up corn stubs and chopping the same
with the stable into small pieces or fragments,
and scattering the same over the ground to be
COVER FOR PLANTI BARKETS — I.W.
Pack, Bradentown, Fils. This cover will prevent injury to the fruit from pressure, either
extension or internal, and by means of which
the grower will be entabled to pack and ship
his largest and timest fruit, and have the same
same from the ever or other crates stacked
upon the crate in question.

#### Of General Interest.

Of General Interest,
REGISTERING SEAL PIERN - C D STARPER, Williamsburg, Ky This invention has in
tiwe a press having associated threwith a register to indicate the number of impressions
taken, the press and register being so combined
as to secure simplicity of construction and insure the positive operation of the register, ac-



REGISTERING SEAL PRESS

REGISTRING SEAL PRESS.

cess to the latter being hed only by the removal of a closure, ordinarily in the nature of a blaged door, which door is normally locked and saied, and is to be opened only by the proper officer. The ongraving above a longitudinal ordiner, and the constructed in accordance with the invention. NON-REPLIABLE ROTTLE: WE Ginnou, 333 Decatur 88, Brookly, N. Y. N. Y. Use is made in this invention of a value mounted to travel in a spiral great to a value mounted to travel in a spiral great to code at its however when the partial grows to load at its however when the partial grows to make the partial grows the



NON-REFILLABLE BOTTLE

casing, the groove being open for the passage of the liquid at the time the bottle is tilted and the valve is off its seat. The engraving of this improvement shows a sectional side elevation of the non-redilable bottle with the valve in losed position

of the non-realisable bottle with the valve in cloud position. Appraison, E. F. D. Month O. A. P. D. Month O. P. D. Month O. P. D. Month O. P. D. P. D. Month O. P. D. P. D. Month O. P. D. P. D

conditions — A M II, De BRUYCKER, 173 Seventh Ave, Brookin, N Y., N Y This in-ventor provides a horsenshe provided with de-tachable anti-slipping devices to permit the horse to obtain a sure frontined especially when going over by roads slippery pavements and the like I is is made of anti-slipping caths as-



ending transversely across the under side of tending transversed; across the under side of the sine and having upwardly-extending lugs engaging the outer and inner sides of the shoe, and transverse fastening pins extending through the said lugs and through the shoe to fasten the cake in place. The illustration pictures in perspective the shoe as applied to the hoof

in perspective the shor as applied to the hoof PARTERIZATION AIPARATUM-C PAULESS, Copenhagen, Isemmark. The characteristic feature of this invention consists in the very large heating surface campinyed in proportion to the size of the apparatus, and in the means provided for the good and thorough sitring which can take place, and insity the case with which the apparatus can be taken apart and cleaned.

cleaned NON-REPILLABLE HOTTLE-1. SCHAF-Part. 676 Knickerbocker Ave, Biooklyn, N. Y. N. The havetone provides a bottle which can-not be refilled but will parmit the ready efflux of liquid from the same. Another object is to provide a bottle in which it is difficult to ob-tain access to the means closely be same. And its access to the means closely the same and to see the same and the same a

opened by whated pressure
DBVICE FOR PRUNKNYTHOI NPIRAD OF
EXPLOSIONS IN COAL MINES — Coavitud, 1148 Pena Are Pitthing H is in this
patent the object of the inventor is to provide
the chamber of a coal mine, in which coal is
being dug, with a multable device cohperating
with the dours being into the said chamber
as that should an explosion occur in this chamter, the doors will be victord immediately.

Hardware and Tools.

HOSE JOKE.—O V JACKNO, care of R. B.

MCCULATION and R L. Pittares, Brunswick,
Ga In this incurrent me improvement relates
to home locks designed to units the end of a
hose to a section of piping or hippie in such a
way as to form a watertight joint and to permit
of a water main or hydras.

CURIY COMB.—W B. RENDING, P. O. Box
311, Minosia, J. N. Y. The present invention
has for its purpose to provide a curry comb
of simple form and strangement having improved means for cleaning the operative surface
of the could, and sho to insure a better grape
tion.

OARDEN BOSE REKL.—E D. MERKER, 300 MERKER,

GARDEN HOSE REEL, -E D MERIKLE, 808 Ayerigg Ave., Passale, N. J. Among the princi-pal objects which the present invention has in view are to form a reel adapted to automati-



cally wind the hose as the reel is moved along the past of the same to avoid dragging the past of the same to avoid dragging the character set forth means for releasing the the character set forth means for releasing the winding drum from the cotary mechanism therefor; and to provide means for holding the scheduler therefor; and to provide means for holding the scheduler than the past of the character set of w. C. Green. 200 Bull in upright position to severe as a sprinking in upright position to severe as a sprinking adjunct. The reel is shown in a front view in a plurality of suction chambers, so that the illustration of the illustration of the scheduler than the sche

Fleating and Lighting.

FURNACE FOR GAS GENERATORS — P. J.

ORA, 761 FORDER AND, BERGA, N. Y. This
lavestion conserves the marinterior mist of heat
by heating the marinterior structure of
the property of the control of the control of the content being raised to the necessary temperature, it
is there maintained by renewing the heat lost
by radiation; and provides a conveyance of air
and gas through the walls and structure of the
furnace to produce the maximum effect.

#### Household Utilities.

Household Utilities.
FIX PROCAPE FOR SCHEENS—H. W.
WEIT, 410 E 40th Rt., Chicage, III. The intention in this case is to provide a screen for
doors and windows of buildings so constructed
as to permit the escape from the building of
such files and other insects as may be upon
the inside and yet effectually prevent the etrance to the building of such files and insects



ple ancape FOR SCREENS as may be on the outside. The acreen comprises a frame of the usual form and of any usual or preferred material. The accompanying illustration provides a perspective view of a portion of a door or window screen embodying the invention and looking at the outside thereof.

thereof.

\*\*HRA/KET-W Parkowski, 414 Bedford Are. Brooklyn, N. Y. Among the principal objects which the invertion has in view are: to provide brackets adapted for installation with-out marring the trim or finish of a door or window opening it is to obviate a number of objections that the present brackets are provided with means for securing them to the trim different from that herotoric employed.

#### Machines and Mechanical Bevices.

Machines and Machanical Devices.
BELT SHIPTER.—E J. EGAN, Winchester,
Ky This invention has for its object the provision of a simple and positively operated
mechanism for use in shifting a belt on stepped
cone pulleys, wherein the shifting mechanism is
supported on a traveling carriage, operated by
a traveling carriage, operated by
a traveling carriage, operated by

cone pullers, wherein the shifting mechanism is supported on a traveling carriage, operated by apported on a traveling carriage, operated by a proper of the provision of a device which will remove the soil by juryers, until the ditch is completed, and which will be entirely means is provided for constraining the machine to follow the ditch.

MACHINE FOR PILING TEXTILE FA.

BRICE—C. J PRINTER, 25 Birecker St., New York, N Y Among other providents this incompleted and which will be entirely means in the provident of the provided by the provident of the provident provident provident of the provident provident provident of the provident provide

center.

MACHINE FOR CUTTING BLICES OF
HUTTERED BREAD AND BANDWICHER.—

S A GAGA, IS Bue de Prebourg, Paris,
France This investion relates to a machine
bread or of sandwiches, the machine being so constructed that the two pieces of bread shall
be of the same thickness and the silicas of buttered bread or sandwiches, as the case may be,
the same of the same thickness and the silicas of buttered bread or sandwiches, as the case may be,
ROYK GATHERING AND EXPERIENTS

delivered in a continuous way.

ROW'S GATHERING AND EXCAVATING
MACHINE—D A GHICHBUT, Belgrand, Most.

Ports similar may be stracked to this maport similar may be stracked to the inportant of the similar position of the similar bed device to this work, and

some situation that of the similar of the sim

sired pr

SAFETY FIRING ATTACHMENT FOR SAFETY FIRING ATTACHMENT FOR PRESCRIPTOR AND AUTOMOTES, SEATON, PROBLEM CONTROL FOR SEATON AND AUTOMOTES, AUTO

ture discharge of the gas into the prejecting paraget.

CLOTH LAYING MACHINE.—A. H. YAP DWANDER and J. E. MOORE, ears of H. VAR DWANDER. CONTROL OF THE PROPERTY OF THE PROPER



CEMENT BLOCK AND BRICK MACHINE

CEMENT BLOCK AND BRICK MACKINE
the eader of the formed block. The object of
the invention is to provide a mackine seased
to be invention in the provide and the provide of
the invention is to provide and a plurality of interchangeable pallets is provided, and a
plurality of interchangeable core supports, the
pallets having openings through which the cores
thosal modi resting on the pallet. Mod asMICHIGHNAT OF MACRIME REMBROIDERT,
—H. BOSEMARDT, St., 965 Hill St., Hobben,
N. J. This invention relates particularly to a
mibroidered fabric where figures are struction
to the fabric intered of forming said figures
by means of color covering or leaf ettich and
more particularly to a method of pantographipattern blank and in forming outlining stitches
bounding said figures after they are stendied
on the fabric digrees after they are stendied
on the fabric figures after they are stendied
on the fabric.

CENTERING DEVICE—F. L. WHERLING

on the fabric.

CENTERINO DEVICE — F. L. WHERLING and F. A. ROOBEN, 168 Lake St., Los Angeles, Cal. This device is for the on lathes and similar matchines, and more especially for centering "effect" over such as creats and cam shafts, valve occentrics, etc., arranged for keeping the work in one cutter while one or more cranks or cans are being turned. For this purpose, use is made of a face pitch satteched to and



CENTERING DEVICE

CENTERING DEVICE.

Totating with the head stock spindle of the latthe, a tail stock face plate mounted to rotate on the tail stock spindle, and work-carrying means adjusted laterally on the said face plates, for anyopering the ender of the work occurrically to the axis of the spindless. The congraving shows a rear riew of part of the laths with the centering device, and showing a creak shaft for turning the creak based for turning the creak based for turning the center.

crank shaft for turning the cranks thereof.

WORD COUNTING ATTACEMENT FOR
TYPEWHITERS AND TYPERSTTING MACHINES—S 7 GOR, Nacho, Gella. This inrelation of the county of the county of the county
setting machine, and readily throwy into and
out of operation, as well as reset, by depressible
shape. Thus the working of the counting downs
of the key-operated mechanism of the machines.

Prime Movers and Their Accessories. Prime Movers and Their Accessories.
INTERNAL COMBIETION BERGING.—D.
R. H. POWLL, Gratton, W. Va. The dejects
here are to powels a derice by mean of which
the covaraging of the engine may be effectively
accomplished in earth in which the
complished in earth in which the
particular and the cylinder; a device in which the
carbon deposit on the piston and cylinder acres
are deposit on the piston and cylinder is
reduced to a minimum, due to complete dembusties; and a device capable of tuning a longer.

History Appel (1987) Apple (198

the sizele canned by well.

RAILWAY SWITCH—I. R. Secons, Lightshericoxide, R. J. This posted Secons, Lightshericoxide, R. J. This posted is second to the second se

to throw the switch.

Forestaining to Mespenation,

BUBRIE RIGHTER—P. H. Courrecture, 18

Orengoist Av, Woodside, L. I. N. Y. Ziths

Inventor provides an apparatus the operation
wheysof results in the forestation of a piercell's

of scap bubbles, one consistend within the other;
and provides means consistend within the expe
rate for insuring the forestation of the bubbles

in the prescribed meaner and correlation.

#### Pertaining to Vehicles.

is the prescribed manner and correlation.

Farstanding to Vehicles.

RESULIENT VEHICLE WHEEL.—H. J.

RESULIENT VEHICLE WHEEL.—H. J.

RESULIENT OF J. R. Schulden, Stowers

Packing Co., Screates, Ph. This wheel has a
hot and a the member spaced theoretical and
the hab and in the rib member for receiving
projections on postunatic members, which are
disposed between these members, the postunated
being reinforced by rode laving threaded the
presentate members, and which are engaged by
material to terminate of the postunatic manuhers upshill be to reinforced the postunatic members and which are engaged by
material to the present of the production of the prod

#### Prime Movers and Their Acces

Prime Movers and Their Accessories.

ORCILLATING VALUE—J. W. DAYE, care of C. G. Bata, Box 260, Whiteste, Mont. This invention relates particularly to oscillating valves for locemotives, and to means for permitting the majest to run free when the valves that the same control of the control

DESIGN FOR A BADOR.—Many F. Star-TERS, care of M. COWAN, 1418 Fifth Are, Manhatten K. N. Y. This presented at cook and the make, the selectal lying obliquely acress the stem and partly on the two lower leaves.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patenties, title of the invention, and date of this paper.

this paper.

We with to call intension to the fact that we are
in a registron to reader comprehent services in every
breach of peace or indenders work. Our shall is
composed to reade-mark work. Our shall is
composed to reade-mark work. Our shall is
composed to reade-mark work. Our shall is
completed to reader to reader the reader of the
complete seature of the redders takes for involved.

We are prepared to reader consistent moving.

We are prepared to reader opinions as to
validity or intringement of passent or with
regard to consider acting in transsound to the readers of the readers of the
staff of the promoculous of passent of the
three compositions making.

We have been a promoculous of passent and trademark and papels on the promoculous of passent and trademark applications filled in all countries foreign
so the Thistod States.

nist s. edition libra editions libra editions libra editions librarie de Co., Mentre de Co., Patrica Alternaga, 2011. Brandway, 2011. Brandway, 1800 Turk, N. T.

th Office: Spinger, M. W.; Washington, D. C.



(12655) "A Reader for Ten Years" has saired us so to the most modern method of making getestic shorts, and what machinery to use, etc. We must saintheasts the fact that we do not narwer analyzanus communications. All letters must

conteins full systems and address of writters.

(1.2865) T. S. S. asks: That there awere been any way discovered to make rafe by artificial scient. A. There is no proof that any rain has been produced serificially, or when rate would not have failed by a state of the rain scient would not have failed by not series. The U. S. way utilizing that any shock can be given to the sit by supplied prowder to cause the condensation of molecure to rate, since thousands of cuitic males are invalved in even a moderate storm, males are invalved in even a moderate storm, as more book, which we send for \$4.50.

[1987] We were Trenumberly receive the

surg unithing that any shock can be given to the
art by suggified proude to cause the condensate
site of subscure with a given the condensate of cube
The topic is reasond in Millians' "Memorology"
a new book, which we send for \$4.90.

[13867] We very frequently receive the
question, "In the Missistopi liver higher at
its mouth that it is at its source." A cothe giver is farther from the center of the
carth it is not in south than it is at its source,
and also that it ran flown hill all the way
for the subscription of the send of the send

#### NEW BOOKS, ETC.

THE NEW NAVY OF THE UNITED STATES By N. N. Stebbins. Introduction by the Admiral of the Navy, George Dewey, U. S. N. 160 half-tone illustrations' New York: Outing Publishing Com-pany. Price, \$1.60.

we will be surely a present on a vision of the referre at writions places along in the second point in the question, the altitudes of the referre at writions places along in the second of the referre at writions places along in the second of the referre at writing places and the second of the referre at writing places. The second of the referre at writing places are along the referred to the second of the referred at the refer The Twelvey Princeron. See Principally.

The Twelvey Principals of Erricipally.

The Twelvey Principals of Erricipally.

By Harrington Emerson. New York:

The Twelvey Principal Supports.

102 Dept. Principal Supports.

103 Dept. Principal Supports.

H. American industry, ludged by sealiy attainable standards, is only thirty or cont efficient, then the sooner American industry awakes to be situation, the better for all concerned. As we have a support of the standards and the s

and possibilities of soap bubbles. The substance of the book was originally delivered in the shape of popular loctures before juvenile audiences, and serves admirably to awaken the youthful mind to the marvels of natural phonomens, and to incide it to further and more serious study. to incide it to further and more serious study.

CONSTRUCTINI CONCERTE PORCHES. BY

A. A. HOUGHTON. New York: The Norman W. Henley Publishing Company,
1912. 59 pp.

CONCERTE BIRDIORS, CILVERTS, AND SEWERS. BY A. A. HOUGHTON, 132 Nessau
Street, New York: The Norman W.

Henley Publishing Company, 1912. 55
DD.

pp.
These two books may be commended for their clear, conclass discussion of important phases of concrete construction
TEXT-BOOK OF PHYSICS. By C. E. Lineberger. Boston: D. C. Heath & C., 1911. 12mo; 471 pp.; illustrated.

1911. 12mo; 471 pp; illustrated.
As an elementary text, written for the average
student, appeal is first made to any knowledge
of the topic which the average student may be
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READER'S SERVICE TARDIY's week passes but the Editor rateer who as the human transfer of the Secentife. Amend who as the hum whether they shall seed their but to a technical school Whether a boy shall become segment, a chosen or a ravial extractive it are questioned to the second of t Scientific American in deciding the matter of education for their some : EDUCATIONAL BUREAU

## Industrial Chemical Research Robert Kennedy Duncan

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## V.—Shall My Boy Become a Chemical Engineer? By M. C. Whitaker, Professor of Engineering Cham-istry, School of Chemistry, Columbia University

This is the fifth of a series of articles intended to set forth fairly the business isibilities of the technical professions. The articles are prepared by men who are connected with the more important technological institutions of this country and some connected with the most important technological matriations of this country and who are for the most part prominent educators. Because these teachers have instructed hundreds of young men in the principles of engineering, they are best qualified to write upon a subject so immensely important in the future development of American nanufacturing industries.—Editos.]

its population. The natural resources of a country may be exploited by a foreign people, but the national beneats from a true industrial growth can come only from native initiative. Industrial wealth inoreases as a result of research and dis-sovery, and all developments not based on solid scientific knowledge are unstable and soon become undermined.

The first requisite for permanent industrial growth, therefore, is a class of leader of thorough scientific training combined with a natural or acquired talent for developing applications Advancement in the science and the art of mining, rail-roading, electrical applications and me-chanical developments is necessarily solely dependent upon such a body of men. more thorough and complete the training the greater will be the facility with which they handle the mevitable new prob arising in their work, and the greater will be their contribution to the profession of engineering, and to permanent industrial

Schools of mechanical engineering have for forty years met the demands for men to develop the innumerable applications of mechanical principles and physical laws, and the graduates of these schools are engaged all over the country in designing building and operating appliances for the utilization of power and the transformsutilization of power and the transforma-tion and application of energy. The effect of their work may be seen in the develop-ment of the multiple expansion steam engine, gas engine, steam turbine, trans-portation machinery and innumerable other mechanical applications.

The education of men for the applica-tions of electrical energy has kept paor with the development of the dynamo, the with the development of the dynamo, the motor, the telephone and the telegraph, wireless telegraphy, etc. Our railroads, buildings, bridges and municipal works are directed and developed by the products of numerous schools of civil engineering. No would question the wisdom of the one would question the wisdom or the establishment of schools to provide the training for these engineers. The scientific and industrial development in their reand industrial development in their re-spective fields has amply justified the existence of such schools and the demands for their graduates are constantly increas-

There still exists, however, a branch o engineering, the scope and possibilities of which are greater than all of the others combined, and that is the field of manufacture involving the principles of chemis try. The value of the chemical product manufactured in the United States during last year aggregated over \$8,000,000,.

The development of the men to build up, manage and operate the numerous units going to make up this great industrial division has, until recently, been largely a

hit and miss matter.

Who is best equipped to design, build Who is nest equipped to design, ourself and operate our factorice and processes founded on chemical principles? Certainly not the electrical engineer, educated to work around the pivotal point of abentical theory and with little or no knowledge of chemistry. Certainly not the mechanica engineer, specially trained in the development, use and application of power and energy; nor the civil engineer, educated in the theory and practice of construction; nor the mining engineer, educated to win the raw materials from the earth. Among Applied Chemistry
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THE industrial progress of a nation trained in the application of engineering depends primarily upon the skill and methods to chemical problems is amply inventive talents of a certain portion of illustrated by reference to the history of the population. The natural resources of a number of our noted developments. The chemistry of the Solvay soda process was available for thirty-five years before the evaluate for introduce were solved. Our present water gas system lay dormant for fifteen years before engineering talent could make it commercially successful. The principles on which the wonderful contact process for sulphuric acid is now operating, were well known to the chemist for many years before the indispensable for many years better to independence chemist-ongineers were found to solve the large scale applications. The electro-chemical principles published by Faraday lay fifty years awaiting the development of the mechanical and electrical appliances d to perform the chemical functions needed to perform the chemical runouous.
The European monopoly of the world's
supply of sulphur was broken by a man
who had the courage and skill to engineer
well-known physical and chemical principles and thus create a new American industry.

In the other engineering branches there

is usually a prompt application of newly is usually a prompt application of newly discovered principles, but in the chemical field there is often a long delay between the publication of a new idea and its successful industrial application. Innumerable illustrations might be dited to show the lack of correlation between the science of chemistry and modern engineering develop-ment. If the principles followed in the training of mining, civil, mechanical and training of mining, oven, mechanicas acleotrical engineers are correct, and their results seem to justify this conclusion, the field of chemical manufacture has been sadly neglected, and the difficulties experienced in the upbuilding of many of our now successful processes have been due to a scarcity of men trained in the special

to a scarcity of men trained in the special field of chemical engineering.

Other engineering developments are already being hampered by unsolved chemical problems. Bome of these prob-lems remain unsolved from lack of knowledge, some from lack of resources to pursue the necessary investigations on an illuminating scale, and others from the failure to centralize engineering resources around the focal chemical point. Railroad engineers are demanding improvements in the chemical composition and manufacture the deminds composition and manuscutive of steel to reduce the number of catastrophes occasioned by the rapid increase in the speed and weight of trains. Disintegration of structural materials like coment and steel are hampering engineering deve ment, and chemical manufacture itse ment, and chemical manufacture itself is handicapped by a lack of erfractory metals and materials. Fuel problems, food prob-lems, illumination problems, problems in-volving the conservation of life and property, are becoming more pressing as a result of the advance of general engineering. In almost every one of these difficult and important problems, the solution will

and important problems, the solution will come through a better knowledge of chemistry and its applications. Fally alive to the importance of chemical engineering as a profession and are pro-viding excellent courses of training both in the fundamental sciences and also in the study of the application. These chemical engineering courses require new and expansive abovertory engineers tuits caemical engineering courses require new and expensive laboratory equipment quite different in kind from that heretofore used in engineering school instruction, and infinitely more varied in its scope. The development of great laboratories of en-gineering chemistry will naturally offer the best facilities for the investigation of great industrial problems. In such editeds, men with a knowledge of the theoretical

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Earnings range from \$100 a week upward

#### The Annual Convention of the Master Car Builders' Association By Reginald Gordon

THE annual convention of the Maste Car Builders' Association was held a Atlantic City, N. J., June 12th to 14th inclusive. The deliberations of this body of practical railroad men are always productive of matter of great value to the transportation world, especially in this day of large, heavy, steel cars, increasing rate of wages and always closer supervision by State and national commissions. There is a marked tendency among the various technical, railway and manufacturers' asso-ciations, of which there are many now in existence, to work together in the investigation and solution of the new and increase ingly complex problems that arise from time to time in the economical operation and maintenance of railways. A large proportion of the membership of these societies is composed of technically edu-cated men, whose opinions and decisions on questions relating to their respective departments of a railroad are of great value, involving, as they do, the expenditure of millions of dollars annually for labor, new materials and supplies.

After the address by the president of the M. C. B. Association, reviewing the work done during the past year, and the general progress made in car construction, general progress made in ear construction, the convention listened to a report upon specifications for cast and rolled steel wheels for cars. The experience gained during the past few years with the wheels used on 50-ton capacity coal and ore cars used on 50-ton capacity coal and ore cars has shown the necessity of establishing rigid specifications governing the chemical composition, method of manufacture and mode of testing of steel wheels intended for that kind of service. While the majority of wheels in use under freight cars are of chilled cast iron, a kind of wheel that has given years of satisfactory service in the United States and Canada, many railroad men now distrust its margin of safety under modern conditions with heavy loads, which in the case of a loaded car means which in the case of a loaded car means a weight of 37,000 pounds carried on every one of the four axles. The effect of bad track, the brittleness of the material at the low temperatures that are common above the 40-degree parallel of latitude, and the excessive heating caused by the brake shoes applied to the wheels on long descending grades, require a wheel that is very strong, hard and tough in its characteristics. The steel wheel costs more than that of chilled east iron at first, but its dependable period of service is longer. Nevertheless, there were many members at the meeting who advocated the continued use of cast iron wheels, having found th satisfactory for all kinds of freight service ascuractory for an kinds of freight service; particularly on account of the low first cost and the guarantee by the manufac-turers of a definite life or mileage, in addition to an allowance for scrap value when worn to the limit of safety. The wheel makers also are willing to furnish a cast ron wheel guaranteed for use under cars of 70 tons capacity; but as yet there are only a few of the latter, for special service omy a new or the fatter, for special service such as the transportation of bridge mem-bers, large castings or heavy guns. A very timely discussion was held on

tion of box cars, with parti reference to the transportation of their contents without loss or damage. At all important divisional points, freight care are inspected in the running gear, and air brakes, in order to determine whether the cars are fit to run. An examination of the roofs and doors for leaks: of the floors to determine whether there is any oil, lime, sold or any other wet or corrosive substance that would damage certain classes of goods; or of the sides and ends for the removal of the sides and ends for the removal of projecting nails, spinitered boards, etc., is seldom thoroughly done. Then again, many cars are sent out loaded fixt so in-ascuraly fastened that the theft of their pontents is an easy matter and one that is constantly occurring. The numbers agreed that much more detailed inspection of ceas is needed, as is evidenced by the sentencus sums of money constantly paid out by railroad companies in settlement of values for ions and damage of goods

# A plain talk on Carbon Deposit.

There are three mistaken ideas on carbon deposit.

(1) Light colored oil is commonly supposed to leave the least carbon deposit. (2) Heavy-bodied oils are often avoided through fear of excessive carbon deposit. (3) Claims that some lubricating oils are "non-carbon" are often accepted as sound.

Our experience has clearly shown that:

- (1) Color is an unsafe guide in determining the amount of carbon in an oil.
- (2) The body of the oil does not determine the amount of carbon deposit. The heaviest oil that can be properly used gives the most efficient automobile lubrication.
- (3) "Non-carbon" oils do not exist. Lubricating oils are a hydro-carbon product. Were all carbon eliminated, the oil could not lubricate. The free carbon is the only carbon that can be safely removed.

The amount of carbon deposited in the cylinders depends partly on the carburetion and gasoline combustion, partly on the oil, partly on its fitness for the car.

Unfortunately, the more the layman tries to comprehend carbon deposit, the more he is bewildered. He needs authoritative guidance.

Equipped with the experience gained from our authoritative position in lubrication, we studied every make of American automobile and many foreign makes.

We found that no one grade of lubri-ting oil would suit all cars. We procating oil would suit all cars. We produced our Gargoyle Mobiloils in several grades, and prepared a schedule showing the correct grade for each make of car

The complete schedule (printed in part on the right) will be mailed you on request.

We refined and filtered these oils to remove free carbon. Aside from furnishing the correct oil for each car, that is the most that any producer can do toward eliminating carbon deposit.

We can say without fear of successful contradiction, that these oils establish a world standard for automobile lubrication.





A guide to correct Automobile lubrication

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by various processes is treated very fully in the Scientific American Supplement.

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1384 Lond-burning describes an oxy-hydro

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in transit. They also urged upon all ti fellow members the serious consideration of stouter construction, better materials and more frequent inspection of all parts of box cars in order to reduce the loss from the causes mentioned.

Owing to the increasing variety of the distillates of petroleum that must be accepted for shipment in bulk, the M. C. B. Association has found it necessary to promulgate specifications for the construcon of tank cars for the transportation of different kinds of oils, naphthas, benz etc., to cover not only the material to be used in the tank plates, but also the method of construction, whether riveting or welding, and the size and location of the safety valves on the same. These specifications are also in accordance with the requirements of the Inter-State Commerce Comnission on the same subject. Safety valves on tank cars must be set so as to blow off at a specified pressure, in proportion to th vapor tension of the liquids contained; and must operate and relieve the pressure which the car may be exposed, either by reason of wreck or a conflagration near the

A committee reported to the convention A committee reported to the convention that the railroads have great difficulty in securing satisfactory rubber hose for air brake and signal connections. They find that some hose stretches too much, besoft, porous and leaky; and, on the other hand, some hose becomes brittle, and cracks, also causing air leakage. I a matter of common knowledge amo It is engineers and trainmen that locomotive air pumps in freight service are overwork and this is largely because in a long tra there are usually many leaky hose lengths to which air must be supplied in order to maintain normal pressure in the train pipe. The committee has drawn up specifications covering the quality of rubber and canvas to be used in the manufacture of standard in health of the standard of the air-brake hose.

Another question to which the conven tion gave considerable attention and dis-cussion was the report on the electric lighting of trains. As is well known, there are three principal systems in use: (a) the "head end" system, employing an engine driven generator in the baggage car; steam for the engine being supplied from the locomotive; (b) storage batteries carried in boxes under each car; and (c) the axle lighting system, having a generate mounted on one of the trucks of each or and driven by a belt passing over a pulley on the axle. This system also employs a storage battery as an auxiliary, to supply electricity when the train is not running a well as at speeds less than seventeen mile per hour Two standard voltages, 30 and 60 volts, are in use; the tungsten lamp i now in common use for this kind of light ing, in fact, is used almost exclusively, and a great deal of study and experimentation has been turned upon finding the best kind and shape of shade to furnish pleasant illumination, bright enough for reading, without objectionable glare. Car wiring is put in regular conduit, and all circuits are brought to a switch panel in the car and provided with approved types of fuses. Few people realize the advance that has een made in the art of train lighting dur ing the past two years; and in this con-nection the Association of Railway Electrical Engineers has done a great deal of work in developing the details of successful electric lighting for trains; not only in designing new apparatus, but in perfecting mechanical appliances for axle mountings,

battery boxes, etc. Other topics presented and discuss were those on car coupler side cle and standard dimensions, best location of train pipe for steam heat connection, freight car springs and cast steel truck frames. The committee on brake shoe traines. The committee on brake same tests also reported progress in the investiga-tion of rate of retardation of revolving our wheels by brake shoes at different pres-sures. It was stated, however, that the results on the brake shoe testing machine conditions, where the wheel is relling along a wall, and, that consequently the conclu-sions where the support of the constant

\*

The subject of ear shop appressions was brought up, and the occasenass of opinion seemed to be that boys who enter a shop as apprentices do not have sufficient enough, agement held out to them to indees them, to continue in the oar department of a subway after they have become first-obser workmen. In consideration of the knowledge and still acquired surrig apprenticeably, many young men seek employment where they can obtain better pay; unsally with the railway outgroment manufacturer; so that the railway companies have a rather limited number of trained, skilled men upon whom to depend for making promotions.

The sessions of the M. C. B. Association The sessions of the M. C. B. Association closed on June 14th, and were followed a few days later, June 18th, by those of the Master Mechanics' Convention, held also at Atlantic City.

#### Experiments with Blue Glass (Concluded from page 11.)

Through two or more thicks blue glass look at a lighted candle pla at a distance of more than six feet from your eye. While so doing hold your fore finger vertically in contact with one corne of your eye and bring it slowly toward the center of the eye until it intercepts a part and only a part of the beam of light which passes through your pupil (see the accompanying figure), that is, comes dimmer. Instead of one flame you will then perceive two. They stand side by side: one is blue, but the other is as red as blood, without any admixture of blue. Thanks to the anachromatism of the human eye, the crystalline lens acts in that case as a prism and the suppression, through the cobait glass, of almost every intermediate color between the two extremes of the spectrum allows the clear separation of the red from the blue. to the forefinger its object is to close the central part of the pupil and to allow the passing of light only through the most anachromatic part of the crystalline lens i. e., its margin.

Chancing one day to look through two lasses, one blue and one yellow, placed one behind the other, the physicist Simler was amazed to find out that while other objects were but little changed, foliage and grass had become of an intensely A glance at the spectrum of the color. light reflected by chlorophyl explains the mystery. This spectrum contains an exmystery. This spectrum contains an ex-traordinary amount of the extreme red for which the cobait glass is transparent. Most other colors are stopped either by the blue or by the yellow glass. The experiment is well worth being made, as the appearance of a landscape with every about as usual except that every leaf or fantastic. Unless the blue glass is very thick and dark two pieces, one behind other, must be used. One yellow glass is enough. It is essential that the vegeta-tion be in full sunlight. Diffused light on

a cloudy day gives no results at all.

Although the writer has come across more than one mention of the curious ex-periment he is about to describe, he has been unable to find the name of its author. Besides the blue glass a concentrated solu tion of quinine sulphate, to which a few drops of sulphuric acid have been added, is needed. With this liquid used as ink and a pen cut out of any piece of wood ( a steel pen should not be used), the experimenter writes on a sheet of white paper. When dry, the script causet be read, as quinine sulphate is as white as read, as quinne suppare is as what ear the paper. But if it is pinced in a dark room, in such a position as to be lighted only, or almost only, by a beam of sus-light which has passed through a bine so-balt glass, the handwriting, while so lightbait glass, the handwriting, while so light-ed, is plainly visible in white on a bine field. No other sympathetic ink equals quinine sulphate in the rapidity with which the script can be made to appear

or to disappear.

The writer has failed to obtain some results with a bine screen made of a material solution of sopper suite which absorbs the and and most of



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rieset and ultra-riolet rays. Methylene blue, which allows the passing of these was given positive results. It is probable that the explanation of the phenomenon thes in the absorption by the cobalt glass with the color rays as do not cause the funthus considerably darkened, but the fluorescent script remains about as luminous as if to white light.

#### Superheated Steam in Locomotive Service

A N Abstract of Publication No. 127 of the Carnegie Institution of Washing-ton, by W. F. M. Goss, has just been issued as Bulletin No. 57 of the Engineering Experiment Station of the University of Illi-

This bulletin gives a summary of foreign practice in the use of superheated steam; it contains a report of an elaborate series of tests made upon an American locomo-tive to determine the precise advantage to be derived from superheating under various conditions of locomotive service; and it shows that the use of superheated steam is not attended by serious difficulties. The superheater is easily maintained, and its presence as a detail of locomotive mechanpresence as a cream or rocomotive mechanism introduces no new problems in maintenance. The superheater improves the efficiency of the locomotive through the saving of coal and water. Tests run with boiler pressures varying from 12° to 240 pounds per square inch, for which the steam was superheated approximately 150 deg. Fahr., prove that neither the steam nor the coal consumption is materially affected by con-siderable changes in boiler pressure. This fact fustifies the use of comparatively low fact justifies the use of comparatively low pressures in connaction with superheating. The saving in water consumption was found to vary from 18 per cent at a boiler pressure of 200 pounds to 9 per cent at a boiler pressure of 240 pounds, the corres-ponding saving in coal warying from 17 per cent to 8 per cent between pressures of 129 pounds and 240 pounds. The power capa-ity of the superheating locomotive was found to be greater than that of a satur-sted steam locomotive of the same general dimensions.

dimensions.

Copies of Bulletin No. 57 may be obtained upon application to W. F. M. Goss,
Director of the Engineering Experiment
Station, University of Illinois, Urbana,

#### The Current Supplement

THE current issue, No. 1905, of our Supplement brings a number of interesting and important articles. Mr. Cooley reports on some tests of vacuum oleanors.— Mr. Miller gives a concerte example of the applications of Motion Study to the improvement of manufacturing efficiency.— Mr. John Jay Ide, who is well known to our readers, describes the Tatin-Paul-han Asor Torpodo.—Trot. E. F. Northrup gives a most interesting survey of the range of temporatures known to us in the laboratory and in unture, and of the prop-erties of matter as it is exposed to different portions of this large range.—There is no nation in the world's history which has shown such rapid rise from comparative obscurity to modern eiviliatation as the reports on some tests of vacuum cleaners. surity to modern civilization as the ances. Something of what the Japanese have done in science is told us in an article entitled "Some Japanese Scientists."

The utilization of water-power through the medium of electricity, for industrial purposes, is a subject that can never lose to the control of the

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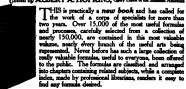
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# SCIENTIFICAMERICAN

#### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

XOLUME CYT. ]

NEW YORK, JULY 13. 1912

PRICE 15 CENTS

## Prof. Elie Metchnikoff

The Most Distinguished of Living Bacteriologists and His Work

By Sir Ray Lankester, K.C.B. and F.R.S.

[T] HE following article is abstracted from an enamy the initiated "Metchnikoff and Tolatop" by Mr entering one of a series of popular scientific discourses collected in book form under the title viscence From an Basy Chair' (Methaco and Co.). The author criops a personal acquaistance with Prof. Metchnikoff and, is therefore, able to give first hand information on a study of prolonging human My, which

has executily attended velot-aproved attention.—Sorrosa. The recognition of the derivation of man from animal ancesiors, and of the complete community of the structure and the chemical activity of the organs of an animals, has made the study of the diseases of animals a necessary feature in man with those of the organs of animals a necessary feature in the understanding of the diseases of man. The farrenching principle of lawwin that the machanisms and processes observed in the bodies of plants and of animals (including man) must have been selected in the situation of the structure of their structure of their utility, led Metchnikoff to inquire what is the value or use of the processe called inflammation and of the failure corpuscies" or "phagacytes" (so called by him) which wander from the blood into inflamed thesios. This question had led him to the discovery that the phagacytes engulal and destroy discuss-germs, and are the great protectors of the animal and human body against bacteria and others germs which calter cut and wounded surfaces, and would start disease were there are not "inflammation." which is nothing more nor less than a nerver-equilated stagmation of the circulation of the blood at the wounded stop, and the consequent arrival at this spot of thousands of "phagocytes" which pass out of the stagmant bood fitrought the walls of the fine blood-tweeds. These arraises of phagocytes.

proceed to ext up hart usearry all the germs we not to the wound-from the skin. The utility of unfammation and its gradual development, necessary and the skin and the state of the skin and the state of the skin and the state of the skin and the skin an

amile in experiment and liquity.

Metchniker' is now devoting all his attention to the possibility of prolonging human life. The facts seem to show that if we are and drank only what is best for us, and led lives regulated by reason and knowledge, we should, nearly all, attain to eightly or even one hundred years of age, having healthy minds and healthy hodies. We should die quietly and comfortably at the end, with much the same feeling of contentment in well-carried repeats at that which we now experience in going to skeep at the end of a long and happy day of healthy exercise and activity. Metchnikoff thinks that the cause of too early death may be ascertained, and when assegratised avoided or removed. In 1870, in a little book on "Comparettive Longevity." I distriguished what we may call the "possible life" or "potential longevity," of any given human being from his or her "expectation" of life. It is probably not very different races of men or individuals, and is probably higher than King David thought, being one hundred on one hundred and twompowers, and not morely seventy years. We all, in or hearty all fall to last out our "losses" owing to sectdents, violence, and avoidable, as

Harry . . Hille .

years is named as our tenure when the injury done to us by unhealthy modes of life and by actual disease are considered as inertiable. Metchnikoff proposes to discover and to avoid those conditions which "wear down" most of us and produce "sentility" and "death" before we have really run out our lesse of life.

Human beings die most abundantly in the carlices years of life. Matistics show that a birth the chinnes or expectation of life is only forty-the years, while at ten years of year. May repect to live to be slixty-one of the same years of the life of the same of the probably. If you are what is cuited a "health," life, die when you are skxty-five. But if you survive to ise fifty, you may expect, if you have not any obvious discase or signs of "beast up," nonbert eventy years, and will probably die at sevenly; surviving to skxty, when may expect, if you have not any obvious discase or signs of "beast up," another twenty years, and will probably die at sevenly; surviving to skxty, you may expect, if you new what passes for "beating," is less than a sevenly; surviving to skxty, you live to seventy-three. Now, it is conceinly with regard to life after forty or fifty years of age that Mechnikoff is interested. Those who have survived the special dangers and difficulties of youth, and have arrived at his mature age, ought to be able to realize much more frequently than they do soundthing like the full "lense of life." There seems to be no reason why they should not avoid the usual rapid "senile changes" or weakness of old age, and survive, as a few actually do, to something like one hundred. The causes of "senile changes" and the way to defeat their operation are what Metchinkoff is studying. Hardening of the walls of the arteries set up by certain avoidable disease contracted in earlier life, and by the use of alcohol (not only to the decree which we call "drunkenness," but to such the decree which we call "drunkenness," but to such a degree as to make one depend on it as a "glek-ine-up") is an undomitted cause of that weekness and list.

agraph by Hope.

BLIE METCHNIKOPP

after lifty years of age. The causes which produce hardened arteries can be avoided

Another cause of scalle changes is declared by Metchnikoff to arise from the continual absorption of poissontons substances produced by the decomposition of partially digested food in the lower bowel or large intestine. This is at pressent the clief subject of his study. It is to prevent the formation of these poissons that he has introduced the use of sour milk, prejacred with the lactic formant.

Metchinkon has made some very interesting experiments in progress with animals. He used the large tropical Trule-string bats, or "flying foxes" and also monkeys. Bats have a very short intestine, and very few bacteria and of very few kinds are to be found in its contents. On the other hand, there are as many as intry district kinds of hacteria producing patterfaction or other chemical change in the digestive canal by millions. By properly feeding the flying foxes in his laboratory. In Paris, Metchinkoff actually succeeded in getting rid of all bacteria from their disestive canal, so getting rid of all bacteria from their disestive canal, so that he obtained adult mammallan animals, not very remote from man in their structure, food and internal chemistry, which are absoutely free from the Intestinal parasitle bacteria which he supposes to cause poleoning and sentle changes in man. It is obvious, without pursuing the matter into further—he has animals which are free from them. He can make an experiment, keeping some of his last still free from interted and causing some to be largely infected by this or that kinds and he can compare the result in regard to the bouth

and chemical condition of the animals. So, too, the patients from whom the lower intestine has been removed, may very probably furnish thin (through this assistant who remains in Loudon) with important facts for comparison with the condition of persons who have not been deprived of this part of the digestive apparatus.

I have given this sketch of what my friend is doing, in order to furnish some notion of the kind of investigation which he pursues. He does not expect to extend the "lense" of human iffe, but by assertialing in a definite scientific way the true tales of internal and external "hygiene" he does hope to give mankind an increased "expectation" of life, in fact, to enable a vastly integer number of men and women to enloy that lease to the full, and to die without disappointment and regret, even with contentment and pleasure, at the end of it.

Metchnikoff was in Bussia in the spring of 1909, and spent a day with Toistof. The 1909, and spent a day with Toistof are greated artist and the greated strends of Russia. Tolstof is 81 yours of age. He took Metchnikoff out alone for a drive in his pony-cart so as to talk with him without interrupten. "What do you think of life?" was the first question he asked, and one which it took my friend some time to answer. In regard to vegetarianism the two great men did not agree. When Metchnikoff declared that there was less crueity on man's part in kilting with animals to cat them than in leaving them defined animals to act them than in leaving them had been animal or from starvation. Tolstof observed thin that was argument and reason, and that he paid no attention to them; he only guided him self (he said) by sentiment, which he felt sure told him what was good and right!

# SCIENTIFIC AMERICAN Pounded 1845 NEW YORK, SATURDAY, JULY 13, 1912

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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### No Contest for the Gould-Scientific American Prize

R the second time Mr. Edwin Gould's generous offer of \$15,000 for a safe, multi-motor, flying machine has failed to meet with any effective The Contest Committee was present at the field of the Hempstead Plains Aviation Company. which had been kindly placed at their disposal for July 1th, and as none of the entrants had a machine on the grounds, the Committee had to go through the formulity of declaring that there was no contest. Mr Gould does not feel justified in making a further extenson of time, and the prize is now definitely withdrawn

Of the eleven entrants, only three or four seem have made any serious effort to build a machine that would comply with the conditions. One of these, a biplane, built by the Burgess-Curtis Company for Howard Gill, was completed, tested in flight and ready to ship, and we greatly regret that the meritorious attempt of this voung and promising aviator should have been frustrated by the failure of any other entrant to have his machine ready for the contest

So far as the other entrants are concerned, the Scientific American is of the opinion that the failure of the few that made an effort to build machines was due, not to lack of interest in the competition, but rather to the want of adequate means and facilities. But what is to be said of the indifference of the various plane construction companies outside of the Burgoss-Curtis, who, having both the aeroplanes and the motors, and experienced pilots, might have placed machines on the field at a moderate cost and with little inconvenience?

We are driven to the conclusion that they are more concerned with gate receipts at flying meets than they are with the development of the art itself for its own sake a deplorable condition to exist in the country which gave birth to the first practicable acro-

It cannot be objected that the conditions imposed for this contest were too onerous. Certainly they were not impossible, for while our aeroplane builders are holding back, Germany has shown us the way in most brilliant fashion. The flight of Hirth with a passenger from Vienna to Berlin in a two-motor, two-propeller monoplane, at a reputed average speed of sixty miles an hour, was a feat far more difficult, surely, than that demanded under the conditions of the Gould-Sciences: American Prize

Not can it be urged that the object which prompted Not can't be urged that the object which produpes M. Gould's offer was wanting in appeal. If we were asked to many the quality in an aeroplane which, just now, is most urgent in its demand for consideration, we should unbestatingly name that of safety. The alarming number of avastors of experience who have fallen to section do ath during the past few weeks should be taken as a loud call for any device of a practicable nature that will render a sutton reasonably safe—and among these, the provision of separate motors and propellers, with one plant normally in reserve, must always hold a high place. The prize which is now with-drawn was notable as the first and only offer made for an improvement whose object was to protect the life of the aviator, and render the new art reasonably an fu

Mr. Gould's generosity, to say nothing of the several inducements offered by certain leading papers, has silenced the complaint of the aviators that they do not receive, in this country, the financial assistance which has carried aviation in Europe to its pro commanding position.

#### The Death of Melvin Vanin

E have spoken somewhat gibby of the "Conquest of the Air," until the phrase has become trite, and savors of platitude. Yet almost daily we are reminded only too foreibly that the air is not yet conquered, that the battle with the element is still being waged, and is claiming its full toll of human life. We follow with interest and pride the records that are newly established almost every week in the field of aeronauties. A mournful record belongs to last week. On Thesday July 2nd, Melvin Vaniman, with his crew of four men, met their death as the result of an explosion aboard the "Akron," the airship on which Vaniman hoped to cross the Atlantic, on the previous day Miss Quimby and Mr. Willard were dashed to death from a monoplane.

When we read the roll of victims that the air has

claimed, or the account of the heroic manner in wh the men aboard the "Titanic" met their death, for a moment some of us may feel our scientific creed shaken. What of the principle of the survival of the fittest? Is it not the brave and daring, the heroes, that are being swept away, while their less enterprising or more timel follows are preserved in the safety of com-mon everyday life? Are the brave, therefore, to be classed among the "unfit," to be weeded out in the progress of time? The answer is not far to seek. Some individuals must be sacrificed that the community may Just how this benefit arises we may not always be able to see in any one specific instance. But can we doubt that the nation which harbors such characters as Vaniman, or whose men stand up under the test of death as did the passengers of the "Titanic," will carry off the victory in the battle of nations, whether stual warfare or in the industrial contest of peace? Such a nation is "fit," because it numbers in its population men who risk their life in the cause of the advancement of arts and knowledge, or who sacrifice it unflinchingly for the sake of high principles

Vamman, like many an inventor before him, died victim to his own theories; and his sudden taking off is rendered the more pitiful by the fact that his theory was correct, and had he only waited for the completion of his new "wire-cloth" machine, he might escaped disaster.

In seeking to construct a dirigible of constant disent, with a shell of sufficient strength to withstand the increase of pressure due to rise of temperature, he was treading the one road—at least so we judge—along which development of the dirigible must proceed, if it is to become a really practical machine.

Let no one make the mistake of placing this man among the mere dreamers. He was practical, clear-sphted, and logical. His conception of a constan-displacement machine was based upon sound theory and practical experience, gained in his earlier work.
His comparison, in conversation with the writer,
of the spherical drifting balloon, with its steady loss of gas, to a ship that is launched with the certainty that it is leaking so badly that it will soon go to the bottom, was quite to the point. "A ship is watertight and rigid, and my airship must be reasonably rigid and gastight," he said. Vaniman has left behind him in his wire-cloth fabric

a material which may yet prove to be the solution of a hitherto unsolved problem. The failure of his weaker rubber-cloth fabric to stand the tangential stress proves only that in this particular case it was unequal to its duty. The wire-cloth is over 30 times stronger, and it is to be hoped that the line of investigation which has been opened by Vaniman will be followed up by the interests which were behind his meritorious

#### Doctors of Civilization

EAD the teree yet masterful account that Thusyddies gives of the "Black Death," a source wish, despite their romarkable civilization, the ancient peoples clustered in Southeastern Riurope and Asia Minor were unable to combat, peruse Papyr description of the terrible ravages of the Great Plague in London, and the thought strikes home that the gregarious instinct of man cannot be satisfied without paying a tragic toll. The diseases of perilous occupations, the accidents due to unprotected machinery, socitions, an executive due to approve a manifest, the ills obviously caused by poor ventilation, all these can be avoided by the ingenuity of the architect and the engineer. But the posts that have decimated even a rural engineer. But the peers max have descinated even a rural population are not prevented in any obvious way. Their origin is hidden in wells that apparently yield only pure water, in the bites of insects apparently harmless. They are, in truth, discusses of civilisation, which require for their eradication scientific investigation as painstaking and self-sacrificing as the res that have given us the wonderful antitoxins and sera by which we cure typhoid fever, diphtheria, pneumo-

nis and other miledies. nia and atter meladies, territorial similar his territorial to the backward of the state had discovered the state and one of the state maked eye, that are responsible for the motion feech is held to, did it become you the modern profession of mattery as educate, in a word, the doctor of civil and the modern profession of satisfact as educate, in a word, the doctor of civil and the state of th vention is the watchword of that ne prevention of the conditions under which de teria may thrive and prevention of the trait these bacteria should they breed. Not without the sacrifice of men who could ill be spared has this grath been learned. Reroes have been found, willing subject themselves to the stings of bacteris-carry insects, in order to prove that not the exhalations of swamps but the natural inoculating needle of the uito is the real cause of some infectious diseases; missmas do not in themselves cause ills, but simply aid the breeding of the living vehicl

carry disease germs.

Within the lifetime of living men it was thought that only a physician was fitted to be head of a Board of Health. Evan in the smaller towns a medical man is still found intrusted with the well-being of hundreds and perhaps thousands of town dwellers. Gradual the new doctor of civilization, the sanitary engine ually, the public health expert trained to cope not with the ills of individual human beings but with epidemics that devastate whole communities, is coming to the front. Such is the need for these men that our technical institutions are now offering courses in sanitary engi-neering. To the Massachusetts Institute of Technology belongs the credit of having, years ago, established the first of these under the guidance of Prof. W. T. Sedgwick. Other institutions soon followed. They have Sedgwick. Other institutions soon followed. They have all justified their existence by graduating many students, now actively and successfully engaged in public health work. Not many years will pass when the health of every community will be intrusted not to a graduate physician but to a trained public health expert.

#### Lunacy and Morale

HIEF SURGEON PICQUE, of the Seine Luna tic Asylum, is reported to have addressed the Academy of Medicine in Paris on the operative treatment of forms of insanity arising out of apprecia-ble lesions, such as abscesses and tumors of the brain and nervous system; or out of such affections of other organs, remediable by operation, as may affect cerebration through extension of their toxic products in the lymph and blood channels. Unquestionably such surgery may prove effective; the like work of other surus has proved so. In some idiots, moreover, mental regeneration seemingly miraculous has come after thy rold transplantation, or after the medical administration of the thyroid extract of the sheen

Here there is no occasion for skepticism. One does not, however, altogether follow those who claim surgery to be efficient in the cure of human immorality. A brain tumor is a tangible, material thing; but an immorality (or is it an un-morality?) is an entity so metaphysical, so conditioned upon the will, that were difficult to see how surgery can be effective in the premises. And yet it is worthy of reflection that in any prison one sees microcephalics, scaphocephalics and other unfortunates so born with anatomical stig-mata that their moral sense is blunted or perserted. Such are unable to feel responsible for whatever unlawful acts they have committed; the insane asylum not the prison, should be their place of confinement.

The difficulty is that one cannot always see clearly the line separating responsible wickedness from acts against the public peace which have their origin in perversities of the psychic apparatus. The difficulty would be largely cleared up if definitions of mind and rality acceptable to everybody could be formulated. To the scientist morality is the crystallization of natu-ral law, a definition that might help to some very fair

Many humanitarians now hold extreme views as to many nutriantana now not extreme vaws as to irresponsibility for criminal acts—views which, if gan-erally accepted, would surely imperil the social struc-ture. It has indeed become very difficult, to such ex-treme has the pendulum now swung, to convict those who have committed the most believes, the-sides, there is a tendency to make prisons so comfort-able that one is pussled why those against whom indictments have finally been secured, do not immediately enter these luxurious institutions, instead of wasting so much of the time of jurymen, and so much of the publie funds, in proceedings which so rarely end in viction. There is, moreover, constant agitation for the substitution of trepanning for hanging, of optometry for trial by jury; such depravity as may not be eradicated by the dentist, or by the nose and throat specialist, or by the adjustment of proper spectacles, may nevertheless, by the exercise of a little considerate patience, yield to deep breathing, or the rest quest, or the hot air apparatus, and the like.

#### Engineering

Marie Marie

that Engineer in High Abstrates.—A gas engine, says Science Competon, was created several thousand fost approach to the second of the second of the second to the second and it was consulted that the loss was due to the national of the station. Upon investigation of the therotted and practical considerations involved, it was found that there is a loss of about 1 per cent of the inditacted horse-power for such 1,000 feet of increase in elevation. The effect with a low ratio of compression is elicitly less than with a high degree of compression.

The Power of an Als Brake.—Some idea of the power of an air brake may be gained from the following facts: It takes a powerful locomotive drawing a train of ten passenger care a distance of about five miles to resolt a speed of sixty miles per hour on a straight and level track. The brakes will stop the same train from a speed of sixty miles per hour in 700 feet. Roughly, it may be stated, says Science Conspectus, that a train may be stopped by the brakes in about 3 per cent of the distance that must be covered to give it it aspeed.

Anti-"Baggage-Smanber" Mata.—We have received from the Pennayivanic Railroad Company drawings of an interesting and, we are told, very successful cushion for unloading begages from trucks in baggage rooms. The mats, which are 22 kj mohes wide by 4 feet. 4 inches long, across which are nailed 24 pieces of seray air-brack hone. We are informed that the mat does its work admirably, of which fact no doubt the prospective railroad trucker will be the company of the properties and the properties are the company of the properties are the company of the properties are the properties a

Utilizing Pansma Canal Plant—We have recovered from Mr. Frank Vanneter, of Canton, Ill., a suggestion that a part of the dredging and excavating plant at the Pansma canal might be shipped, when the canal is completed, to the Mississepi Valley, and there used by the Government in re-building and enlarging the present leves system. It is suggested that the excess material deedged from the river might be utilized in filling up a part of the adjacent low-lying lands, and that this would at once serve the double purpose of increvaing the flood capacity of the river and recovering land which is now subject to flooding.

Electifying a Canadian Steam Rallroad.—An important work of electrifuction is being down on a section of the Rossland Divasion of the Canadian Pacific Rallway, in British Columbia, extending from Rossland to Castlegar Junction. The Rossland Divasion is 20.3 miles in length, and if the sidings and tracks in the yard are included, the total length of track to be electrified is 43 miles. Current at 60,000 volte will be reconvert from the West Kootenay Power and Light Company, and the healing will be done by four 75-ton electric bosomotives. It is yet to be determined whether alternating current at 6,000 volte, or direct current at 2,400 volte, will be on-

The World's Largest Building.—The first day of July the topmost piece of steel work was rovated in place on the Woolworth Building in New York. This structure is notable as being the lottiest building devoted to business purposes in the world. From the sidewalk to the top of the cupola is 750 feet, which is 50 feet more than the height of the Metropolitan Building m this city, and 138 feet more than the height of the Ninger Building tower, also in New York. The building contains fifty-five stories in the tower. It is of the standard steel column and foor beam construction; but in order to take care of the enormous dead load and the great wind load, the columns are necessarily of unprecolonised size.

The laner Structure of Metal.—J. Alfred Eving, in delivering the May lecture of the Institute of Metals, drew attention to the fact that when it was desired to examine a metal microscopically, the first stop laten was to polish the section. As Dr. Beilby had shown in the previous May leaver, this polishing seriously affected the constitution of the surface, making it quite different from that of the motal below. It produced an amorphous layer, distinct in constitution from the crystalline structure, which became appeared when this layer was removed. This symoval was commonly effected by a fight chemical stated, the metal being exhed by a weak add. It could also be done by heating the specimen and withining eway or evaporating of the amorphous phase.

Cape Cod Canal Progress.—Whos the delegates of the recent Instruction Navigation Congress visited Cape Cod, they were assured that this work would be opened to traffic during the winter of 1913, or at the latest in the spring of 1914. The canal will provide a 25-hoot depth from Barntable Bay to the 30-foot depth in Bussards Bay, a distance of 12½ miles. The minimum width on the bottom will be 200 feet. The canal will enable ship to avoid the dangers of the stormy outside passage around Cape Cod, and it will shorten the distance from Booton Cape Cod, and vessels of a total tonnage of 25,000,000 passenger pass around Cape Cod see darying passing through Long Island Sound by 65 miles. Fifty thousand vessels of a total tonnage of 25,000,000 passengers pass around Cape Cod overy year, and the majority of this traffo, it is expected, will seek the shorter and more selected routs.

#### Electricity

Condensers on Lighting Circuits.—The use of condensers on bight between contain better encounty and power factor on the curcuits of low-voltage lamps has been rendered possible by improvements in the manufactum of tinfoil and parafilmed paper condensers. By immersing the condenser roll in melted parafilme after vacuum imprevance, and subjecting the parafilme to high mechanical pressure during cooling, thorough durability, and officencies up to 99 per count at full load, are readyly obtamed.

Street Cleaning by Electricity.—In several German cities street weaking machines driven and operated by storage batteries are in operation. The machine employed is a 3½-ton vehicle equipped with a 45-ed harter giving 200 ampere-leure at the 5-hour discharge rate, with traveling speeds of 4, 6 and 9 miles per hour. It carries a heavy tank of water, brushes, and rotating rubber scrapers. There are 24 of these machines at work in Berlin at present, with six speend charging stations, and each machine covers 18 to 25 miles per day and costs less to operate than a horse-drawn machine.

A New Light-weight Storage Battery.—The present capacity of local-plate storage batterns capable of with-standing the shocks of ordinary mechanical usage to which they are subjected in automobiles, electric cars, and railroad trains is stated to be 30 to 35 watt-hours per kilogrammo of battery. The principal of the Royal Technical College, Copenhagen, has announced the invention of a lead-alloy storage lattery the plates of whost executional procuss on as to mercase the active surface in contact with the electrolyte. At a dashage current elensity of about 0.005 amperso per square continuctor, which is the normal for ordinary translighting cells, and an ampera-hour efficiency of 91 per cent, the capacity of the plate of the new battery is stated to be 4½ times that of the ordinary battery plate.

Crystallization of Metal Lamp Filaments.—It is well known that the metal filaments of modern incandescent lamps become more fragile after use. A recent investigation of the changes set up in metallic filaments by use, including a microphotographic study of both "drawner" and "extrudied" filaments, has proved that the continued high temperature at which the filaments are run easiest the metal to crystallize. The corres crystales which ultimately mean breakage of the filament as built up by accretion upon the fine crystals in the original structure of the metal. Drawn-wire filaments, having a fine initial expitalization, are stronger affired, but slow no advantage over the ostruide filaments after both have become crystallized.

Electric Lighting for the British House of Commens. The electron lighting which it is proposed to substitute for gas in the debature chamber of the House of Commons is to sometist of groups of them ented Hisment Lamps inclosed in a holophane globe and placed ever a square of amber intated gloss. This provides three therefore the common state of the properties of the properties of the globes. The amount of the common state of the globes, the common state of the globes of t

Detecting the Proximity of Icebergs.—A Canadian physicist has devised a microthermometar for detecting the proximity of fee at we by observing the temperature effects in the water current around the mass of melting fee. The instrument for this purpose is inclosed in an iron cylinder, arranged to be submerged about five feet below the surface of the water and is commetted by cable to an electrical registering and recording device on elect. This sensitive apparatus registers temperature variations otherwise entirely overlooked, and indicates the presence of an incherg at a datance of half a mine. The character of the temperature changes and the rate at which the charges take place are found to be more significant for determining the presence of ion than the temperature themselves.

Advantages of Electric Locomotives.—A recent paper on electric locomotives for the handling of frequent in rail-road yards and in mining brought out clearly certain advantages over steam locomotives apart from the elimination of fire and smoke and the difference in the elimination of fire and smoke and the difference in the efficiency of the central station boiler and engine and the (smaller) locomotive belier and engine. The electric locomotive can be relied upon, as long as the line voltage is maintained, to develop its full power at any time, being independent of the state of a boiler, the skill of a fireman, or the quality of feel. The truck addiction is better—smerimes as much as 20 per cent better—because the torque of the driving wheels is uniform throughout casch revolution, and there is not the same tendency to stip when starting under load as in the steam locomotive. The traction can be increased indictivity by sanding the rails, since the electric locomotive can draw power indefinitely from the line. No time is tort on the road for cooling, watering, boiler tending, or watting for steam pressure to rise.

#### Science

Dr. de Quervain's Trans-Greenland Expedition is now under way, the party having sailed from Copenhagen for the west coast of Greenland the end of April.

Tenth International Geographic Congress.—This much-postponed meeting is, according to the latest announcement, to be held in Rome in the week beginning March 27th, 1013.

A Dry Month in England.—During April, 1912, the total rainful registored at Greenwich observatory was only 002 inch. This is the driest month recorded at that observatory, at any period of the year, for 100 years.

Dr. S. Rona, late vice-director of the Meteorological and Magnetic Institute of Hungary (the national weather service of the country), has been appointed director of that institution.

Explorations in Iceland.—A remarkable series of explorations was earned out in Iceland during the years 1910 and 1911 by a Swiss traveler, Herm Stoll, who covered a distance of over 5,000 kilometers (upward of 3,100 miles) in the course of the two years

Finger Prints in Banks.—German banks, according to newspaper dispatches, have begun to introduce the finger print as a mark of identification on checks.—The method is already in use in the United States.

Climatic Statistics of the British lates. —A point committee comprising two representatives of the Meteorn-logical Office and two of the Ro al Meteorological Society is planning the publication by these two organizations of a collection of climate normals for the British Isless. Barometre pressure and wind direction will be first dealt with.

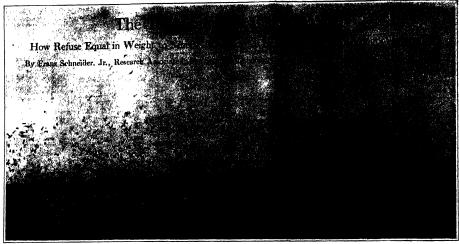
Designs for the Australian Capital. According to press despatches the first prize in the competition for designs for the new seat of government of Australia, viz. 21,750 (88,516), has been awarded to Walter Burley Griffin of Cheago, the second to Eliel Saarmen of Helsingfors, Finland, and the thirst to Alfred Agnelic of Paris A decided three years ago, after long discussion, the new capital city is to be built in the Yass-Camberra district of New South Wales

Another Attempt to Scale Mt. McKhiley. The Bulletin of the American Geographical Society reports that the expedition to Mt. McKimley which left Parhanks, Alaska, on February 5th, fitted out by a newspaper of that town to attempt the ascent of the mountain, returned unsuccessful on April 10th. An elevation of 10,000 feet was reached on the north side of the mountain east of Peter Glineer, where precipitous see elifs prevented further progress.

The Harber of Colombo. In 1875 the late king 184 and VII, then Primes of Whies, but the first block of the southwest breakwater of the harber of Colombo, e.g. lon. Prior to that time the harber had been an open road-stead, exposed to the full visioner of the monosine. On May 184 of the present year the Governor of Ceylon, Sir Henry McCallum, had the final stone in an extension of the southwest breakwater, thus completing the construction of one of the finest artificial harbors in the world, whell is a square nule in area and capable of accommodating 40 to 50 vessels of over 12,000 tons. The total sost of construction has amounted to about \$15,000,000

Banas Flott.—Banas flour specially prepared as a toun-food is making it suppersize emb Parsunder the name of Banaséme. It is to be remarked that within a recent period this fruit was but little used in France, and even now its consumption is hunted. However, measures are being taken to increase the unportation, and it is said that 70 vessels were recently fitted up for bringing the fruit to Europe. Banass flour has a much more extended use in England than on the continent, but efforts are now made to introduce it in France courge to its great nutritions value. The banasáme is a preparation made for convenient use, and it contains 60 per cent of banase, flour, this being put through a sterilizing process at the proper heat.

A Rubber Substitute from Sea Fish.—A press statement forwarded by Consul Frauk W. Mahm of Anverendam, tolls of a factory established at Vimuden at the mouth of the North Sea Canal in Holland to produce a substitute for rubbe, and it is reported that the company operating the factory has succeeded in producing a substance having the qualities of rubber and some special advantages over the genuine. While the process is a secret the principal ingredient is said to be fresh sea fish, which are brought to Vimuden in vast quantities by the Dutch fishing fleets. A coording to report 15 to 16 jer cent of natural rubber is added to the fish, and the result is a substance as fleethe and clastic as rubber, but much cheaper—about as 125 to 8 in price, compared with real rubber. The low price of this product will be caused partly by the by-products which are possible, for it as said that much albumen will be made from the 5th and that half of the factory is arranged for the manufacture of fertillizer.



Gulls in the wake of garbage scows.

AT the head of this article is a picture of sea, not a sanitary way, but dumping at sea, not a sanitary way, but at the same time in use by some of the large American cities. The number of gulls may serve as a measure of the enormous quantity of refuse, portions of which are almost certain to be stranded on neighboring beaches.

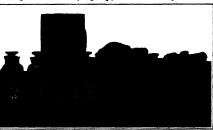
rations, portions or winds the atmost evertain to be stranded on neighboring beneficially called the gathered together, the routiing mass would equal in volume a cube about one eighth of a mile on an edge. This surprising volume is over three times that of the great pyramid of Ghuzch, and would accommodate one hundred and forty. Washington monuments with ease. Looked at from another standpoint, the weight of this refuse would equal that of ninety such shaps as the "Titane". When it is remembered that this volume does not melude swage or other laquids, but only the dry, or relatively dry, parts of the city's wates, it is evident that the problem of refuse disposal is one of the first magnitude, calling for great engineering skill and the expenditure of large sums of money.

account of its great bulk, but because of its extremely heterogeneous nature. In agri-cultural districts the matter is relatively simple: garbage is fed to the stock, old paper and other combustible material are quickly burned, and the unburnable rubbish goes to an unobjectionable dump heap. In the city, however, matters are much more complex. Ashes here become an un-portant factor in the disposal problem. forming one half of the entire refuse by volume and two thirds by weight. Street sweepings, containing much horse manure and ordinary dirt in various guises, must also be cared for The diversified nature of the city's industries and occupations is, of course, what operates to make the refuse so extremely heterogeneous, Almost any so extremely heterogeneous. Almost any conceivable object, ranging from orange peel to bucycles, and from mattresses to dead animals, may appear. In attacking the problem, however, four general classes of refuse are recognized, garbage, ashes, rubbish, and street sweepings. Special wastes—as from slaughter houses—will be encountered, but the main phases of the problem are indicated under the above Disposal may be said to have a two-fold object: to dispose of the material without nuisance or injury to health, and to attain this end at the minimum expense. Methods of Collecting Garbage.

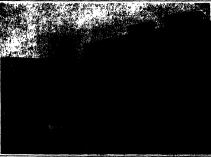
Any comprehensive plan for complete disposal must take cognizance of the methods of collection. If separate treatment is to be given to garbage and rubbish, it will



Filling scows with refuse (not garbage) to be used in making new land.



Garbage, ashes, aweepings, when collected in the Borough of Richmond (Nev York) are thrown into a refuse destructor, where it is burnt into clinker This clinker can be utilised in the same manner as broken stone in concret



The tonks contain grosse obtained from New York gathage.

be advantageous to have the homesholder put the two in separate receptacles, and separate systems of carting will also be indicated. If, on the other hand, the garbage and reluxes are to be tracted together, as they are in England, there will be no advantage in separation by the householder or in any separate systems of collection. The means of collection and disposal at present in vogue are almost as varied as the character of the material itself. There are different methods for each of our classes of refuse, and from these a very large number of plans for complete disposal may be devised. The determination of the best combination of methods for a given community is a matter of very considerable difficulty, and calls for special knowledge and engineering skill. It is sufficient here merely to note the inter-relations of disposal and collection schemes, and to pass on to a consideration of the principal methods in vogue in treating each of our four sub-divisions of refuse.

Let us consider first the disposal of garbage. In small communities the garbage in small communities the garbage in small communities the garbage and small communities the garbage arrangement satisfactory in farmures, as the satisfactory in farmures, as the satisfactory in from the standpoints of sanitation and cost. Again, it may be plowed into the ground, although this is now rarely practised. In larger communities collection and disposal to farmers is increasingly difficult, and this method becomes impracticable. Recourse is sometimes had in this case to mere dumping, either on land or water. The practices of dumping garbage on land is one that cannot be defended from seatherist or sanitary standpoints. The dumps become ill-standing operators, and are ideal places for breeding of flies. Dumping in water may be attended by serious unisance artising from material diffting back conto the shores, and, like land dumping, is at best a prediction of the same production of the same primitive methods may be discarded and more setentific ones—attaining more perfect disposal, and sometimes capable of actual profit—may be adopted. These are methods of reduction and inclemention.

Reduction and Incineration.

In the so-called reduction areatment of garbage, the aim is to recover the grease from the material. Ordinary garbage contains, as a rule, 2 per cent, and sometimes as much as 3 per cent, by weight of grease, Reduction and the colorident recovery of grease are accomplished it awe general ways. In the first, the garbage is cooked in large those described the cooking the containing the cooking the coo

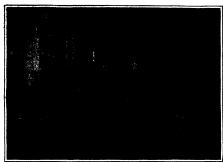
disputing, the emacetal is purt through present gaingring the wake and present and present and present and present and present and the state of the present at the state of the present at the state of the present at t

PRINCE SERVICE AND A COLOR

be considered with regard to our other classes of refuse. In this method the heat for incineration must be obtained not only from the garbage itself, but from ashes and other combustible waste. It is here that distinction between incineration and the little-used cremation enters. In the former, the heat is obtained from the refuse itself; in the latter the garbage is burned at the expense of some regular fuel, such as coal or oil. Incineration is carried on in specially constructed furnaces. Garbage as mixed with the other refuse in the proper proportions and special devices are ployed to feed the material into the fur-naces so as to secure the best results. This method of disposal is entirely satisfactory from the sanitary standpoint, and gives, under proper operation, a slag or "clinker" which is valuable in construction work, while the resultant heat may be trans-formed into steam or electrical power. In the earlier attempts at incineration, using natural draft, the furnace temperatures were too low; objectionable amoke, noxious odors, and an undesirably soft clinker re-sulted. With the introduction of forced draft, these difficulties have disappeared, and in Europe, and in England esp and in Elirope, and in Engand especially, the disposal of the city's refuse by this method is complete, unobjectionable, sani-tary, and sometimes profitable. Boilers are installed in the incinerators which will furnish relatively large amounts of valuable power. This may in turn be utilized for the generation of electricity, or for pumping when the incinerator is located in conjunction with water or sewage disposal works. On account of the unobjectionable worse. On account of the nonlinectionsoire nature of a properly designed and operated incinerator, it may be located in the center of the city, thus reducing the expense of haulage. As has already been indicated, there file year difference of opinion as to the comparative merits of reduc-tion and incineration. Reduction has been a favored method in this country, bu owing to the large extent to which th process is in the hands of private interests, the facts as to the actual costs of the enterprises have not been fully available. In England, incineration has reached its high-est development, and there appears to be an increasing use of this method in our own

# The Objectionable Method of Dumping.

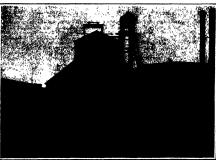
The twocite way of disposing of sches is by dumping, atther on land or in the water. Askes are often of real value as filling-in material, for made land. Theorysteally the land dump is messly unsightly and dusty;



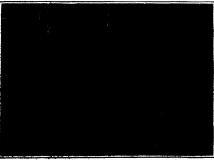
Chute and digesters at the Barren Island garbage reduction plant



Filling in Riber's Island with New York city waste (ashes, dirt, etc.).



How the garbage of New York city is unloaded at Barren Island.



The present of the Barron Island garbage reduction plant.

there is not the sanitary objection that may be urged against the garbage dump. But practically, from the fact that it is impossible to secure the proper separation of waster by the tonant, the asif dumps in a crowded locality are largely garbage dumps with all their disadvantages. One must not forget, furthermore, that the ordinary run of ashes contains a very considerable amount of useful heating value which is lost when dumped.

The dumping of ashes and rubbish into water is open to much the same objections as the similar dumping of garbage. Unless the material is carried far enough from shore, and conditions of wind and tide are favorable, serious nuisance is certain to arise. The cost of carrying the material an adequate distance from shore then may become very consulerable.

become very considerable. Rubbish, making up about a quarter of the total by volume and a sixth by weight, may be sorted over, paper and other rombustible material removed and sold or burned for heat, while there is some salvage in junk. This picking over of rubbish is very dusty work, and there is a question as to its effect upon the health of the work-men.

Street sweepings with their manure may be plowed into the ground, or may be dumped, or may be disposed of in the incinerator. The last of these alternatives as perhaps the most desirable.

These are, briefly, the various methods by which municipal ruluse is now being disposed of. The more pruntive methods, as the selling of garbage to farmers, and dumping indiseriminately, are showing a tendency to disappear. They are being replaced, more especially in the larger cities, by the more scentific methods of reduction and incineration. The actual detailed plan which will be the most efficient for a given community can be determined only after an investigation of the nature of its rules, and by the character of the community itself and its surroundings. The objects which must be carried in mind in making a selection of methods are to remove the wastes quickly and completely from sight without the creation of nuisance or danger to health, the recovering of whatever is valuable, and the carrying on of the whole operation at the minimum expense. The field of refuse disposal is one in which there is great variety of opinion and, perhaps, a lack of scientific practice. It is one, however, which by its magnitude and financial importance is worthy of the attention of our best engineering ident.

#### Stains on Brick

THE brown, white and yellow stains which frequently disfigure brick buildings or walls are the result of a saline efforescence which may sometimes be removed, according to the Bibliothèque Uni-verselle, by washing with slightly acidulated water, when pure water proves inade-quate. Prevention, however, is better than cure. The stains are caused by particles of soluble saits which have been car-ried to the surface by water and are then ried to the surface by water and accuratellized by evaporation. These comprise sulphates of potassium, sodium, magnesium, and calcium, aluminum, magnesium, and calcium, the last being the one commonest found and the one most resistant to rain. Chlorides and carbonates are also often found These salts pre-exist either in the earth or s used in manufacture, or in the mortar or sand, the latter being especially the case near the seashore, where sand from the beach is commonly used without the precaution of washing with fresh water. The entry of salts into the brick occur during the baking, also, when coal contains pyrites Care should be taken to use water of low mineral content, especially as regards sulphates. Where only "sulphur water" is available it should be neutralized with a barium salt (the chloride or carbonate).

## Wireless Telegraphy in Peru

WIRELESS communication has been established between Lima and Iquitos, across a vast stretch of the Andes, without the use of intermediate stations.

# The Business Side of German Science VII

## Making Money With the Aid of Technically Trained Men

By Waldemar Kaempffert

THIS is the seventh of a series of articles, writ-ten by the Managina Editor of the Scientistic American, on German industrial conditions. The author was sent abroad by the publishers for the express purpose of gathering the material on which the articles are based. In this and the article to follow, the part played by the technically trained man in German business is pictured

The amazing industrial development of modern Ger-many is to be attributed in large part to technical edu-eation and to the application of science to business cation and to the application of selected to business Capital and science work hand in hand. Every one of the great chemical discoveries of our times, most of them made in Germany, are the vesult not of hap-hazard experimenting, but of systematic research that has meant the expenditure of princely sums. All German manufacturing is so thoroughly saturated with science, that even the small producer practises on a miniature scale the methods of his larger rivals.]

THE notion that industrial success is largely a matter of luck dies hard. The huge American trust is a refutation of the oft-repeated fable that chance plays the largest part in business success. In Germany the evidence that conspicuous industrial success is not newadays attained without well-directed effort, without the aid of technically trained men, is even more apparent than in America. Every prominent manufacturing firm in Germany maintains its department for industrial research

## The Wonderful System and Organization of the

The wonderful System and Organization of the Germans.

The scientific work of a great German manufacturing company naturally divides itself into three classes. In one class men are to be found whose duty it is to control the manufacturing operations from a special laboratory; in another will be found men who are engaged to do research work pure and simple, for the purpose of improving existing manufacturing processes, devising new ones, or discovering new products; and finally in the third class are men who try out a r on a miniature factory scale in order to determine its commercial possibilities

Perhaps the finest example, outside of the chemical industry, of the technical control of manufacturing operations is to be found at the cast steel works of Krupp at Essen. The uniformity of the Essen products is to be attributed entirely to the rigorous scientific control of the entire cast steel plant. Each step in the manufacture of steel is checked up in the labora Analyses are made by the hundred. The work been so systematized that boys and young men do the actual work under the supervision of a chemist. Thus it becomes possible to make five hundred analyses of fron for cerbon dioxide in a day. The laboratory workers simply see to it that Bunsen burners are lit, that retorts are boiling, and that filters are working properly. The supervising chemists are thus permitted to perform more important duties than that of watch ing a burette or a test tube. The laboratory workers are simply tools in the hands of their supervisors. are simply (cons in the mains to their supervisions.) They must be intelligent enough to perform the tasks assigned to them, but they must not be so intelligent that they are led to experiment for themselves. A similar method of employing intelligent workmen is followed by the United States Steel Corporation.

Research is not conducted simply by intelligent young men, but by university graduates, as may be supposed. The work is so subdivided that often two chemists working side by side may know nothing of the problem

When after countless trials and failures a discovery is made by a research chemist that seems to have com-mercial possibilities, a small experimental plant is erected in which the same type of apparatus which is to be used for actual work operation, is employed. The to be used for accuait work operation, is employed. The conditions are industrial conditions. Little factories are equipped with little autochaves, little flittering pressess, little hydraulic pressess, and little vats. At a great coul lart de factory near Frankfurt I saw new dyes being tested on a small scale which involved practically the erecting of a miniature leather dyeing plant, miniature paper dyeing plant, and a miniature textile dyeing plant. Thus the sultability of newly dis covered dyes for special industries was ascertained. Upon the dozens of scientific men in the laboratories of a manufacturing company a strict masonic secrecy

# The Masonic Secrety of the Laboratory. It is even said that the director of one part of a great chemical works is not permitted to enter another part,

and that the exact salary of an important man may not be known even to his own wife. So far is secrecy carried that a chemist in one laboratory is frequently totally ignorant of the work done in another laboratory in the same building. He is not allowed, with rare excoptions, to read papers before learned scientific societies, at least not without the consent of the firm. Buried away in the files of the great companies are probably away in the files of the great-companies are probably the records of countiese arguments which, if sands public, would unquestionably advance the whole cause of science. The individual steps, already taken, must be reinfully retraced by university professors who are working for no commercial object. At Essen, for ex-napte, I was told that the problem of gue croston had been so far studied in the thoroutory that the Kruppe been so far studied in the laboratory that the Kruppe considered themselves ten years in advance of America on that point, but when I asked a chemist if he could refer me to any scientific publication in which the Krupp experiments are discussed. I was informed that they had not been published and probably would not be published; that they were, indeed, in the nature

# ent of a German Manufa

A German company is usually managed by a beard, at least one member of which is a scientifically trained man, thoroughly conversant with the technical operations of the plant. One of the directors may be a lineal descendant of the original founder of the ears the name of his ancestors and continues the traditions of the old factory so long as they meet mede requirements. Another director is a glorified salesses. He is a man who has traveled much, who knows go ernment officers, who may ultimately win the fitle of merzienrat and who may even win a sent in the Reichstag. All of these men speak four or five lan-guages and speak them well. With them on the board sit men who have represented the company in foreign countries and who travel six months in the year establishing agencies all over the world.

As a result of this partition of labor it is difficult for one man on the board to overawe the others. The purely business men know nothing of science; they must rely upon the technically informed member of the board. On the other hand, the technical director knows little of business and must accept the views on finance uttered by those members of the board who are bette informed on such subjects than he. As a rule the dire informed on such subjects than he. As a rule the directors are all men between thirty-dre and fifty. Keen, alert, thoroughly informed of basinesse conditions in foreign countries as well as their own, students of international politics, they are, in a word, broad-amided, collected business men of the finest type. Evan the chemists and engineers on the board of directors are consistent or the constraint of the consistent in the scine that they need the nechanical requirements of the world. More, however, is required in that re-spect of the German than of the American engineer. The German enters into direct competition with French, German and Austrian technologists, who mave at their command labor just as cheap as his and just as plentiful. We find him, therefore, thoroughly co versant with every phase of the industry in which he is employed. Nothing escapes him. He knows the source of raw material, its price both to him and to source of raw material, his price both to film and to his foreign competitors, the manufacturing processes adopted in foreign countries and their efficiency as compared with his own. He studies the followarrastes of the foreign market, and seeks to adapt hisself to them. He knows the transportation facilities as well as any shipping agent. He makes a study of tariff schedules and customs laws of foreign countries.

schedules and customs laws of foreign countries. Three men meanly have at their command a large cupital, represented by bends and stocks valued at anywhere free five nillion to ton million dollars. The dye stuff industry of Germany as a whole represents an investment of about several harders and diffy million dollars. There are burylesses and receive fivide lates, Diridands of their properties and receive fivide lates, Diridands of theiry-five per cent are occasionally interest.

allotted. Recause there is more science in German than in American industry there is less audesticy. The offsheed way is which many American business sizes will size a hundred thousand debiars in as exterptive about which they know absolutely notifies, utenply on strength of a friend's well-ament advise, is without a counterpart in Germany. But when the board of directors of a German company has theoretically studied a problem with the aid of competent man, when, as a

result of that study, they have become vinced that in the solution of the prob Found or That study, they have necessity con-vinced that in the solution of the procision them; there is commercial possibility, money is lepset from the pos-sure of the manufacturing plant. Thus the state of the stress manufacturing plant. Thus the sible to erect the next manuscruzing peam. An Badische Anilin und Soda Fabrik spent about for lion dollats, it is said, to develop the present a of making synthetic ladigo on an industrial sosis the pecuniary sacrifices thus made were not risk the perumany accrance thus made were not resided for work that might or might not exceed. The result was foressen and inertable. The company knew that, given time, money and brains, the problems could be solved. Every path was explored, every channing re-action that could possibly be supplyed was tried, with the result that every obsensit now knews.

#### Millions for Research

So, too, the Badische spent thousands and thousands of dollars in developing the Schoenherr process for the reduction of atmospheric nitrogen. The late Heinrich von Brunck, who did much to bring the company to its present eminence, realized how important was the solution of the problem. He placed ample funds at the diaposal of Dr. Schoenherr. The Badische Company needed sedium nitrite for the production of anilin dyes. Previously, sedium nitrite had been made by the reduction of Chile nitrate with lead; but this method of production was coulty. On every acre of the earth atmospheric nitrogen to the amount \$1,000 toon presses; for eighty per cent of the air we breaths is composed of nitrogen. At that rate the air over every mine acres contains about two bunded and eighty thousand tons, equivalent to the amount of Chile saltpeter used in 1907. It is no easy matter to utilize the nitrogen of the atmosphere, simply because it is faset, in other words, became it refuses to combine very readily. tion of Chile nitrate with lead; but this method of proother wards, because it refuses to combine very readily with other elements. Schoenherr devised an electrical method of fixing the nitrogen of the air, which is now familiar to the readers of this journal. As a result of the Schoenherr process, sodium nitrite is no longer reduced from Chile nitrate. Practically the entire supply of the world, valued at about one million dollars, is now obtained electrically.

So, too, the contact process of manufacturing sul-phuric acid was developed by the Badische Company because of the demand of the indigo and alisarin manu-facturer for a cheap concentrated sulphuric acid and nacturer for a casely concentrated suppurer acts and sulphuric anhydrid. The demand for cheap sodium and chlorine induced the company to develop the elec-trolytic soda process. In a word, even the raw ma-terials of a great industry are now made by cheap and

fiftient processes, scientifically developed.

The amount of work that must be done in sysmatically developing an industrial process along constantly developing an industrial process along scientific lines is herculean. New methods must be worked set before a way is at last discovered of attack-ing the problem in hand. The work is slow because the investigator must follow an unbiased path. To spend two hundred thousand dollars a year and have nothing to show at the end of that period may se adness. Yet the German chemist knows that given time, money and brains, he must eventually succeed, knows that the commercial returns from a single great discovery are commons. Of seventy-five research chamists whose collective salaries may vary from \$75,000 to \$200,000 a year, seventy may discover nothing, while the other five may discover products that mean a net return of a hundred thousand dollars a year for at least the life of an ordinary pat year or at seast the life of an ordinary patent. That explains why some of the German chemical products notably drups, seems inordinately high in price. Dr. Bherhawit of the Badische Company put the matter thus: "If empitalists are to employ inventors or to take the exploiting of inventions as their business, a means of extening their dividends, they must be as a means of escaling cour unrangement cours from successful inventions for the lossess which they inevitably will incur from unsuccessful todes. Success can be made certain only by taking a cose. Success can be made certain only by taking a large member of chances. A firm employs, let us say, one busined chemists and employs, let us say, one busined chemists and employs in the purpose of sathing and working out inventions. Some of these will, silver make an invention, but their salaries here to be paid. Few can be relied upon to deliver a privage analysis of the companies of their laborations and thair income has to be sessured. If these contracts and thair income has to be sessured. If these contracts and thair income has to be sessured. If these contracts and thair income has to be sessured. If these contracts are the second than the contract of the department primes changed by gatesiance for their problem, and the joines of many people as to thair temperature of the department primes changed by gatesiance for their problem.

(To be assessed)

#### Correnvondence

rs are not cosponable for state the perveyondence column. Anonymous the council be considered, but the name dente will be withhold when so desired.] MICHAE COM

#### A Defense of the Perest Service

To the Editor of the Sometries American:
My attention has just been called to the letter pub-lished in the Sometyper American for June 1st under the heading 'Comment on the Forest Elli." The bias of the writer is no obvious that I consider it unneces-

eary to make reply to most of his assertions; but cereatin passages in his letter compel attention. Forset rangers are spoken of as "apparently imbued sitt the sole idea of 'riding' the sheep, cattle, and industries therein, and principally the men who drive their stock across this country, or who have presave stear stock across this country, or who have pre-vibusly owned for years patented land around the water therein. In this way they make a part of their malary, while the rest comes out of the general Govern-

This nessage is so worded as to engreet that renears are in the habit of levying on stockmen and others their own personal benefit. What are the facts? stockmen who grass their sheep and cattle on the Na-tional Forests pay the Government for the privilege, although they pay much less than it is worth and much less than they pay in the same regions for the same privilege on privately owned lands of equal grazing But all receipts from users of the forests ar covered into the Treasury of the United States, while the salaries of all forest officers are paid entirely from the annual appropriations for the Forest Service made

The writer also says:

"I think much money is now being unlawfully divert-ed and should be curbed, and wish you would interest yourselves in the matter further.

want specific instances, I will furnish them." I should certainly be glad to learn of any instances cific or otherwise, of unlawful diversion of public

concerning which there are bound to be honest differ-ences of opinion and which, from the fact that it col-lides with the private interests. bound to be warmly debated; but it is quite another thing to indulge in reckiess accusation of public offi-cers. If I have allowed public funds to be mis-spent, I should be removed from my position. If forest rang-ers have been taking advantage of their position to practise extortion upon users of the national forests,

ould be in iail. The writers of letters like the one which you published should, as a matter of public duty, lay their evidence before the officers who have power to institute criminal proceedings or to take the proper disciplinary action; or else they should retract their statements. There is no finer or more devoted body of public servants to be found anywhere than the men of the Forest Service, and in justice to them I cannot but protest vigorously against such imputations as your correspondent seems to wish to convey.

H. L. GRAVES, Forester United States Department of Agriculture, Forest Ser-

vice, Washington, D. C.
[The letter of June 1st referred to by Mr. Graves was published without prejudice on our part, and we take much pleasure in presenting the above reply.— Rotros. 1

#### Maritime Canals and Restrictions on Size of Vessels

To the Editor of the SCIENTIFIC AMERICAN

The SCIENTIFIC AMERICAN of even date is before me. On page 679 you have an item referring to Mr. Grunsky's report in reference to maritime canals and restrictions on the size of vessels. In order that your readers may be informed, I may say that Mr. Grunsky's recommenda-tions were not approved. All the writers of the various tions were not approved. An one writers of the various reports, from several maritime nations, of which Mr. Grunsky was Reviewer, and who were present and some who were absent but were represented, unanimously protested against his "Conclusions," considering it to be the work of the International Navigation Congress to pro-

ork of the International Navigation.

of instead of to restrict navigation.

Mr. Grunsky presented five suggested "Conclusions,"

not accepted. The fifth was adopted four of which w four of which were not accepted. The fifth was adopted at the sense of the Congress, which simply stated that a maritime canal should be five times as large as the un-mersed portion of the largest ship which is to use it, with a depth of one meter under the keel, these values being functions of the speed and somewhat of the volume of commerce, and are to be determined by local conditions.

ELMER L. CORTHELL, D.Sc., President Maritime Section of the Congre

#### Bow Rudder for Ships

To the Editor of the SCIENTIFIC AMERICAN: As many of the notable advances in various fields have n accomplished by a process entirely at variance the customary and accepted way of doing things. I think the customary and accepted way or doing unings, I think my suggestion may not be as quixotle as it may seem at first glance. My idea is that a rudder should be at the bow of coean steamships, in addition to the present one at the stern. If the "Titanio" had been so equipped, she

would no doubt have been afloat to-day. The "Hawke" would not dotten aver oeen atom to-day. In a leave of diasater would most surely have been averted. Let us follow the action of a rudder placed at the stern. If the bow is approaching an object, the action of a stern rudder is to awing the stern in the same direction as the object, and the bow is then pointed away, but before a rudder can point a boat away from any obstacle, the whole ship has been swung closer to it, which is the reason that it is difficult for a boat to swing directly away from alongside a wharf. Now let us follow the action of a rudder placed at the bow: On approaching an obstacle, the rudde would be turned away from the object, and would pull th bow of the boat directly away from it, and the ship would track after it, the same as an automobile does in turning a corner. In the case where the smaller boat was caught in corner. In the case where the smaller hoat was caught in the suction alongied a larger one, a bow rudder would have turned the bow away immediately, instead of which the stern rudder simply swung the stern of the boat in as well as the low toward the larger boat. In the case of the "Titano" is bow rudder would have drawn the bow ander immediately, instead of which the stern rudder in that case simply threw the ship partially breaking to the obstruction. Now this idea of placing a rudder at the bow will doubtless be criticised, and one of the first will be the objection to its exposed position. The rudder would not be damaged unless the ship runs into something bow on, a trick not appreciated by good seamen. ourse, the rudder would have to be hung somewhat differently from the stern, so that about three-fourths of it would follow the post, but I think it would be a simple matter to arrange the necessary details. Toronto, Ont. A. C. LAWRENCE.

#### A New Phonograph

To the Editor of the SCIENTIFIC AMERICAN:

May I point out that the sound-recording apparatus of Mr. Lifschitz, described in your issue for April 27th, is not as novel as you seem to think it, as Mr. J. C. M. Stanton, Mr. R. C. Pierce, and myself constructed exactly similar apparatus more than ten years ago. The greater portion of this apparatus still exists in my pos-session, as also one of the photographic records from which the reproducing strip was prepared, together with

As a delineator of the complicated curves which repr sent human speech, we found the photographic recording apparatus most efficient; but as a reproducer of sounds the system was not nearly so effective as the auxetophone of Sir Charles Parsons, which also operates by controlling the emission of air from a charged reservoir. Furthermore, the great length of ribbon that was required made the records unduly bulky.

A. A. CAMPBELL SWINTON.

#### The Fatal Aeroplane Accident at Boston

THE third Boston Asroplane Meet, which was held from June 29th to July 7th, had a pall thrown over it at the close of the third day by the sudden death of its manager, Mr. W. A. P. Willard, and Miss Harriet Quimby, America's best-known aviatress.

The accident occurred at the close of a 20-minute flight to the Boston Light and back, which had been flight to the Boston Light and back, which had been accomplished in a perfect manner by the skillfull avia-tress. She had risen, when at the farthest point, to a height of some 2,000 feet, and had been gradually descending all the way back. She had almost resched the field, and was at height of about 1,000 feet, when the machine made a suddem dip and the body of her enger, who had been seated in the rearmost of the passenger, who had, obest seated in the rearmost or tas two tandem seats, was thrown out of the machine and came hurtling to the earth. For a moment the pitot managed to right her machine, but the next instant it dived vertically and almost turned upside down, the result being that she too was thrown out, despite the strap which she had placed across the fundage just in front of her waist.

As the two bodies fell with terrific speed and struck

As the two bodies fall with terrific speed and struck the water Ware it was quity a yard deep, the ascrplane continued its plunge, but soon righted itself so what it desented at an angle of some 65 degrees and, striking in shallow water, turned upside down and remained on its back unte sweetly damaged.

It is hard to find a plausible explanation of this intertibe societies. Miss Quintilly life from the powerful 70 heave-power Blefrot not more than baff a dosen times, but the had saver experienced any difficulty in managing it. On her first flight at Minsole, she used the complete of the shall be shall also the shape of sind begin in the passenger's cast. She complained of the shifting of the sand, which he shall fall when in lifeth, and afterward who nower than of the remains the new terms. such. She complained of the shifting of the sand, which he she shift first when in flight, and afterward she never flow, sneept with a passenger. Her machine was the latest military-type Bisitot and the believed it particularly in the same accepting a passenger was concerned, because the inter, both loaded some 4½ feet back of his way, such could not interdese with her in any way—sak half happened when the assets were also by side, with addition.

Section 24

To All States

As in the case of Moisant, who was flung from his machine as was Mr. Willard, the most plausible explanation of the accident seems to be gyroscopic force.

A very slight difference in pressure against the front edge of the wing (which might be caused by a sudden turn of only a few degrees, cocurring as a result of an "air hole" or of the pilot's foot slipping off the tiller) air nose or of the pilot's foot slipping off the tillery would, with the heavy 70 horse-power Gnome motor running at full speed, as it apparently was doing, de-velop a powerful and sudden force: that would turn the machine instantly downward and whip the tail around through the are of a circle so quickly that it might even break the fuselage. Eyo witnesses agree that Wil-lard was flung sloft and forward as from a sling, his body falling very close to the plunging machine, if, in fact, it did not hit the latter in its descent. This terrific gyroscopic force acts much more quickly powerfully than does the force of gravity itself. powerfully than does the force of gravity itself. Even a heavy, rapidly-revolving propiler on a non-totary motor engeaders sufficient gyroscopic force to put the aviator on his guard. In all probability many of the terrible accidents which have occurred with revolving-cylinder motors have been due to this unrecognized force, which takes the aviators unswares.

After Willard was pitched out, it appears to have been impossible for Miss Quimby to maintain the equilibrium of the monoplane sufficiently to make a safe descent. That she tried her best to do this, and that she succeeded for a moment, is seen in the fact that the aeroplane straightened out after its first dip and before its final plunge. It is also possible that the control post became jammed, owing possible that the control post became jammed, owing to Miss Quimby resching forward for something, or that it was thrown suddenly forward sufficiently to make the initial dive in this manner. It was in this way that Moissain made a sudden plunge to earth at Belmont Park one time when he was resching forward to turn on the oil. There is also the possibility that a control wire may have broken, but as these were in duplicate this harms about the oil. this is very doubtful.

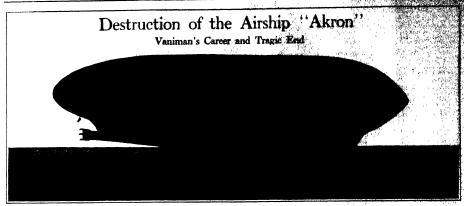
It is possible that a so-called hole in the air may ave caused Miss Quimby's accident. The writer has vivid recollection of seeing Earle Ovington suddenly

tin to one side at an angle of 45 degrees when he experienced such a downward current over the edge of Long Island Sound at Bridgeport, Conn., over a Ovington saved the situation by diving, but he said when he alighted that had he not acted with the greatest celerity, and had he not been strapped in securely, he would have fallen to his death. The aeroplane in this instance tipped with great suddenness, one wing of the machine evidently passing into a swiftly descending current. In Miss Quimby's case, from the accounts of eye witnesses, it seems to have been a forward dive that pitched out the occupants of her

macnino.

Might it not be possible that this sudden dive
was easied by the acroplane striking a fast downward current boad-on, even though it were going 70
to 80 miles an hour? At all events, such currents of
in seem to be most numerous above the coast line,
and avators should be very careful when passing

Miss Quimby, as the readers of the Scientific American are aware, had been flying for something leas than a year. She learned to fly at the Moissan school at Mineola, under the tutelage of André Housenou at Mineota, under the tutering of Andre Hou-pert; and only a day or two before she left for Boston, her former instructor had endeavored to porsuade her to give up flying, as her sister aviatress, Miss Matilde Mossant, has done. She believed in the safety of the seroplane if flown with discretion (and she never flew it otherwise), and it is certain that the accudent which caused her death was not due to fancy flying or faulty manipulation of the machine by her in any way. Miss Quimby was the first woman to fly across the English Quimby was the first woman to the across the English Channel, a feat which she performed on April 16th last, as already described in these columns. She was a self-made young woman, of gracious personality, who had endeared herself to the staff of Leake's Weekly, of which she was a member, and to every one in the aviation frateenity. Miss Blanche Scott, the only aviaaviation fraternity. Miss Blanche Scott, the only aviatress we have remaining, was flying at the Boston meet at the time of the accident. She did not give up on nt of it, but continued to fly every day until the end of the meet



Longitude, 1918, or The Pictorial Name (

The airship "Akren" on one of its trial trips maneuvering close to the water

AMERICAN only introdity vanished by a flash of Amusics of a '8s in the morning of July 24, and with it perchaled American's only accounted emitteer with his revew of four men. The accitent, although viewed by three thousand spectators along the shore of Atlantic City, will ever remain a mystery, for not a sout aboured the vissel survived. Eye-witnesses of the disease speak of a wreath of smoke that appeared, followed by a caving in of the gao bag. An instant later there was a load explosion that burst the envelope, and the car dashed down into the sea, where it fell a heap of weeking in water a few feet deep.

The cause of the dissater is open to conjecture. It seems to be the general outlino that if was due to rapid expansion of gas, under the heat of the sun, although it is not clear that there was much variation in temperature while the atriship was in flight. The Akroni' was brought out at it is, and took to the air without midday. Apparently everything was running smooth), and a number of manevers were executed successfully. After a time it was seen to face to a considerable beliefs, and it was supprehended that Mr Vantinan was having difficulty in bringing the dirightly down, Possibly, and this to a more surmole, Mr. Vaniman attempted to bring the atribuly down by pumping air builded into the bullones. Possibly he had miscalculated the strength of this envelope, or his pressure culated the strength of this envelope, or his pressure valve may have jammed. At any rate, if is probable that a sections leak developed and, that the hydrogen was toucked off by the redthot exhaust gases from the

When the "Akroji" was being built last full, great secrety was proserved concerning the fabric employed Every scap and ellipting of the uniterial was correlative preserved and kept from the hands of sourceal seekers. It came out afterward that Mr. Vantiana placed great hopes in this thirle, for It had been made many three stronger than the ordinary fabric used in a dirighble balloon. He loyed that to prevent expansion of the balloon. He loyed that to prevent expansion of the balloon with every shift variation in the temperature of the gas and to obvide the necessity of releasing gas when the bal

necessity of releasing gas when the bulloon arrows that the rare atmosphere of higher levels. When the 'Akron' received its first test in the light of Nocomber (the last very Al-Vantama found that this perheite was correct and he succeeded in making the dirightle (the and fall by subtracting or adding to the altballing the cavited in his bullonets. For instance, if he wished the machine to come down, he would pump air into the bullonets, compressing the gas and making the balloon heavier without increasing its displacement. His idea then was to pick up water bullost from the owen in what he coiled a "hydro-levatory" Although the flight ended in a mishap, the experiments were successful and led Mr Vanhaan to the invention of the 'wrive wound' dirightle bullon, that is a bulloon made of a futric reinforced with steel wired with

A description of this balloon appeared in our issue of February 17th. The idea was to use, with the cotton thread, steel plane wire no thicker than the thread, weaving the two together in a loom of special construction. The wires were to be of continuous length from end to end of the balloon and the fabric was to be laid on in two layers, one running longitudinally and the other spirally about the balloon. By placing the wires a tenth of an inch apart in one of the layers and a twentieth of an inch apart in the other, he was able to make a fabric so strong that it would resist a pres of 52 inches of water against 11/2 inches of water in the "Akron," and less than half an inch of wa the ordinary balloon. Thus by making the bag thirty-five times stronger than that of the "Akron" he would be able to prevent it from expanding even though the temperature of the gas within rose fifty Fahrenheit degrees. On an airship of the size of the "Akron," the weight of the steel wire would have added about two and a half tons, but this would have been a small price to pay for the absolute stability ob-tained. It would then be a simple matter to bring the dirigible down by pumping air into the ballonets and then to raise the dirigible by releasing the air from the ballonets. The task of constructing such a balloon is no small one, and many problems arose, but Mr. Vaniman showed remarkable ingenuity in solving them. We are informed that he had ordered a boom and was about to begin the actual construction of the new balloon at Atlantic City when the disaster occurred.

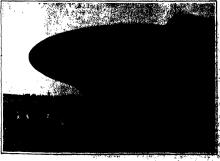
The "Akron" was the first American-bull dirigible selicon to compare favorably with the highly advanced practice in Europe. All our other dirigible ballooms have been mere toys in comparison. The Wollman air-ship was not an American-bull vessel, but was first ship was not an American-bull vessel, but was first the nervely reconstructed in this country for the transatiantic venture. The "Akron," however, may be considered the first and only airship worthy the name that this country has ever produced. It was 25% feet long, 47 feet in diameter, and had a capacity of 400,000 cube feet. It was provided with three engines, two of 100 horse-power and one of 80 horse-power, which were designed to propel the crift at a speed of 30 agites

per hour what all three pairs of propellers were eight atting at the same time. The two after peirs of propellers were arranged to be avong about at such an angle as to drive the sit-ship, up or down as deadered. In addition to this there were planes fore and art is which could be used for stereing the vessel vertically. As in the Wellman strickly, the car was ball in contact with the under side of the gas bag instead of being separated by a considerable space, as in all other types of non-trid dirighbes. This served to stiflen the structure, but brought the highly inflammable hydrogen into close prevaintly with the engines. Possellity this daring design may have been the cause of the diseaser.

Molvia Vaniman met his death in the prime of His, at the age of forty-five. He was born at Virien. III, near Springfield, on a farm. His father, au Okloman, was one of the plucers who opened up that section. The first sixteen or seventeen pears of Valinassis life were spent upon the farm; subsequently he was to college at Mount Morris, near Chicago, and at Valparsiso, Ind. He thes took up the study of musted the Chicago, and was for a time active on the stages as an opers singer. It was upon these operatio tours that he began to carry a camear with him, which, as swents subsequently turned, strangely chough proved to he the first came of his entering the field of aeronaution.

met vause of an entering the seed of acceleration. This opers company with which he was traveling made a western tour to 8au Francisco and Hunoling made as western tour to 8au Francisco and Hunoling broken out in Hunoling, which so affected the commercial situation that the company was disastived. Mr. Vaniman, therefore, looked shout him for some built, see opportunity, and his services were engaged by a stemaship company, which took him on one of its tours to prepare photographs of the westery or world. In this way Vaniman visited New Zealand Tourisis? Departed photographs for the New Zealand Tourisis? Departed photographs for the New Zealand Tourisis? Departed photographs for the New Zealand Contrisis? Departed photographs for the New Zealand Contrisis? Department, and his collection was of such excellence that it was established at the 81. Louis World's Pair, and

d a gold medal, the highest award. Vaniman had constructed a special conserve for his work, which entabled him to prepare very large, passenante pictures. It is this camers which, by a peculiar trend of events, proved the first came of Mr. Vaniman's instruct in he littons. In order to obtain his pictures he was forced to seed out elevanced potent which were effect not easy of access, such as the tops of trees, make and similar inconvenient please. In therefore, conceived the fixes of making of a control of the control of the pippoon. This, plan took him to London, Petris, and Rome. The cuptive failing, theyways, this had that inconveniential had to be stumbed from the single-pipoles of give works. An obvious way to suppose the difficulty would have been to emilted in difficulty would have been to emilted in thoughts to the consequence of the proved, the children would have been described in thoughts to the consequence which in the workship in the consequence which is proved, to be children and make the workship in the consequence of the present consequence and make the workship in medical make the consequence of the present consequence o



The "Akron" emerging stern first from its hangar.



an's life is his introduction to Mr. Well-, we see that finished his first polar campaign and properties. For a second. Offers of plans for a thing halfour, for the second expedition were called said Valolyan's designs were the ones chosen and entrageness seasoon, for the second expectation were called for, and Vashquar's dealings were the ones chosen and he stained, associated thier engineer. He went north in 1807 and spent the summer building the balloon. Two trips were made with this balloon; the first time Two tides were made with this belloon; the first time the crew was lost in a snowstorm, and landed in a gladie. The second trip was hardly more successful, and was breaght to an abrupt and early conclusion by the teering off of the equilibrator, which in this in-stance was beliasted with food and provisions for the jurity. The expedition, therefore, had to be aban-doued. Pearry's discovery of the North Polg put an end to further stramps at Arreit airship expeditions, and the next venture was the Wellman transatiantic ex-medition. milition

grasp the fact that Mr. Vaintan was the mortag spirit in the sepsidion and the engineer to whom all credit for the partial success was due. The attempt was not an utter failure. The "America," as the sirabily was called, stayed in the sit 71% hours, establishing a record for dirigitile balloons, and covered 1,008 miles, which was also a record. The eguilibrator, or fosting drag, retarded the airship to such an extent that it could not keep up with the wieds that were carrying it across the Atlantic, and yet without the equilibrator the simble purely would have been lost on the third day out. As was stated in the Schriftige America at the time, when the "America" was absundond it was structurally just as sound as when it put out from Adlantic City, except that one of the propellers was Atlantic City, except that one of the propellers was

When a member of the editorial staff of the Scien-TIPE AMERICAN visited Mr. Vaniman after his rescue from the "America," and questioned him on the object of such a venture, Mr. Vaniman was careful to explain that it was not from choice that he had undertaken the trip. He felt that the dirigible balloon was being entirely neglected in this country, and that it ought to receive far more attention than the aeroplane. He knew that only by accomplishing something of a startling nature could be arouse his countrymen to the value of this form of acris! pavigation, and he stated

The gas bag affoat at Absecon Inlet.

that if he could arouse outsi interest in some other that it as could arouse equal interest in some other way, he would rather do so. He realized the huzards of navigation in a dirigible balloon, but was sure that they would yield to study and experiment. When the idea of wired fabric occurred to him he was confident that the problem of safety in the air was solved at last ever made extravagant claims for acrist navigu-He did not believe that the dirigible balloon could ever be used for transporting until or express matter or for carrying people from pure to prace on scheduled time, since so much depends upon the direc-tion of the wind. However, he did expect to see the time when stable wire-reinforced balloons would be matter or for carrying people from place to place on time when stance wire-reinforced balloons would be used for pleasure trips and vineation tours. It is a pity that his life was not squared to complete this new balloon and demonstrate its usefulness. We are in-clined to believe with him that it held out unusual promise of success, and unfortunately there appears to be no one else in this country with the ability and experience to carry on his work.

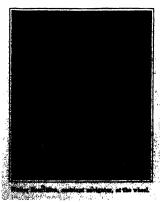
## Radio-activity of Human Organs

DR COARNS, of the Heidelberg Institute for the Study of Cancer, has succeeded in obtaining ex-perimental evidence of the radio activity of various human organs. The first experiments were made by allowing the organic matter to act through a wire grating, on a photographic plate wrapped in black paper Faint radiographs were obtained by twentyfour hours' exposure, the strongest action being exerted by the substance of the brain. In order to prove that by the substance of the brain. In order to prove that the observed effects were really produced by radio-activity of the organic substance, portions of the brain, heart, liver, speem and image of twelve cadavers were incinerated and their radio-activity was tested with Becker's emanometer, by measuring the rate at which the electrometer of the apparatus lost its charge under becar is common to the apparatus lost its cuttge won-the influence of the incherated substance. In most cases, one gramme of the substance produced more or less conductivity in the air. The brain was found to assembly radio-active origin. A surprisingly great effect was produced by the incinerated brain of a person who in life had drunk large quantities of radio-active water for the alleviation of abdominal pains. The kidneys and the spleen were uniformly found to be the least radio-active of the organs examined, and the liver and the heart also showed little med, and the liver and the heart also showed little radio-activity. In two cases the substance of the lungs was tested, and was found to possess a comparatively high radio-activity. The number of measurements is too small to allow definite conclusions to be drawn



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The disrupted envelope falling to earth.

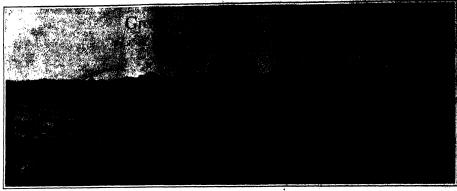








Within the narrow car of the "Akron."



The soil receiving a heavy application of lime required for alfalfa growth

ALFALFA, perhaps the oldest of all our cultivated forage or hay plants, has had a history scarcely less interesting than that of the many nations which have utilized it. Such nations have preserved almost in direct proportion to the extent to which they have used it. The name "alfalia" comes from the Arabs and menus "the best fodder," and in fact it appears to have originated in Media or in some adjacent counas the folklore tales from lands on different sides this area point toward Media as the place when it came. Although in its original state it must have had a narrow range of adaptability to varying climatic and soil conditions it has by successive stages come to be adapted to portions of every continent. Even in this country it grows below the sea level in southern California, where the climate is among the hottest California, where the climate is smong the notices in the world in Colorado it may be seen in full vigor at attitudes above 8,500 feet. In latitude it is equally cosmopolitan and may be found growing from Mexico to Canada as well as in tropical America. The eastern half of the United States has presented a serious comcircumstances working against its succe ful production. A brief survey of its early history and migrations may assist in explaining some of the rea-sons why the culture of alfalfa in the East has med with so many difficulties and why so many points must be safeguarded to assure success

Alfalfa in Ancient Times.

The wars of the Perdan Invasion of Greece took it to the latter country about 500 B. C. it being the cusand to plant fields for the sustenance of the herds which helped support the invading hosts. From Greece it advanced to Italy and Spain by successive stages and was taken to Old Mexico by the Spaniards about D. From here it was carried to South America and later (1854) entered California through the Gold en thate at the time of the activities incident to the discovery of gold in that State. Thence it spread over the irrigated sections and more recently has d its march eastward until now it is by far the most important forage crop of such States as Nebraska and Kansas, the latter having approximately a million acres as compared with a very few thousand two de

The eastern murch of alfulfa halted, however, when it encountered the humid belt beginning with Mi extending eastward to the Atlantic ocean. Alfalfa was developed under scorching suns and in sections almost devoid of natural rainfall and the unnatural conditions presented by a country where the rainfall is at all excessive constitute a great handicap to its successful production. The increased ratinfall causes most soils to be poorly drained and these are usually "scid" in character. Both the poor drainage and acid condition of the soil prove harmful to the plants. This is by reason of the prevention of the growth of the nitrogen-gathering bacteria which are so essential to the welfare of the alfalfa plant which enable the roots to accumulate vast stores and which enable the roots to accumulate van notes of the costly nitrogen from the air, free of charge to the farmer. As has been said these bacteria not only work for nothing and board themselves, but they actually pay something for the privilege of living. They must, however, have the proper soil conditions and these are not naturally present on the ordinary farm in the Eastern States.

Requirements of Alfalfa.

Alfalfa requires a deep, fertile, well drained, well

limed, thoroughly inoculated, acid-free soil. This list of requirements is long, but it means a great deal to ordinary farmer, who usually is unable to immedistely provide these conditions for alfalfa. emphasize the necessity of each of these, it is nece to treat them somewhat in detail.

A deep soil is necessary by reason of the great root nent which the alfalfa plant make West the plants have been known to send down long roots for more than 30 feet into the deep, friable, alluvial soils. It is not able to make its normal growth and compete with the surface-feeding weeds if there is not present a soil sufficiently deep for its roots to penetrate and draw up the hidden stores of plant food which are necessary for the numerous crops of nutri-tious forage and which are out of the reach of the deeply rooting plants. At least four feet of good is usually necessary unless the underlying forms soil is usually necessary unless the underlying forma-tion be limestone, in which case, three feet has been found to suffice. The plants will, however, utilize the ground to a much greater depth if opportunity is presented for them to do so.

A fertile ground is necessary, since the hay it produces is among the richest we have and calls for the extraction from the soil of large amounts of plant It is a mistake to think that because it is a legume and has the power of adding nitrates to the soil that it can be seeded on land poor in the other ess elements of fertility. It cannot add pho acid or potash to the soil on which it grows; and yet acid or potabl to the soil on which it grows; and yet it requires large quantities of these elements in order to produce paying crops of hay. This fertility may be brought into the soil by the use of green manners, com-mercial fertilizers or by the application of a liberal dressing of barrupard manner. The last method has been found to be usually the most satisfactory as, abburently, the manure offers the conditions required by

parently, the manure offers the conditions required by the bacteria which live on the roots of the sifaifa. A well-drathed soil is essential as the roots can not stand lack of drainage, nor can the bacteria which ordinarily live on its roots, exist in the absence of a well aerated soil.

sary on all soils deficient in this m eral, as in the presence of sold conditions neither the eria nor the alfalfa itself can succeed.

It is also necessary to have the soil thoroughly inoculated with the nitrogen-fixing germs in order that each plant may be well provided with these organisms for abstracting the nitrogen from the sir and converting it into a form available to the alfalfa plant.

A weed-free soil is desirable, especially a soil free from perennial weeds which cannot be eradicated by mowing. The annual weeds may be best avoided by eding the alfalfa in the late summer which all seeding the alfalfa in the late summer which allows the plants to attain a fair size before winter. The stand of well grown plants the following spring will do much toward preventing, the development of any freely germainted weeds, it would, therefore, appear that it is possible to raise alfalfa in anny parts of the Estetern States, in case proper athetion to give the table selection and preparation of the ground. A number of warm may be required to develop a poor, field to the proper richness to hold the stand of alfalfa.

On account of the rather peculiar and exacting requirements, respecting soil and factilizers, as well as the high price of the seed, alfalfa is not what may be "poor man's crop4" neither is it a crop for a run-down or unfertile farm. Its present uncertainty on many types of soil should also retard the man of

limited financial means from going into its production on an extensive scale at first.

It is suggested that an experimental sore be estab it is suggested that an experimental sure of suchtivisions, lished and divided into a number of subdivisions. Each subdivision should be given a different treat-ment as regards fertilising, liming, time of seed-ing, rate of seeding and preparation of the soil. ing, rate or seeding and preparation or the source Each one of these plots will answer at least one ques-tion regarding the effect of a particular method of treatment. In this way the information which would otherwise require a number of seasons to procure, can be obtained at the end of the first year. The treat se optamen at the end or the first year. The treatment proving best adapted to the particular conditions present can be applied to a larger area the succeding season. In this way alfaifs can, if shown to be adapted to an individual farm, become established be adapted to an individual fairs, become established on that farm at the least possible risk to the owner or worker of the ground. The first seeding will usually furnish an abundance of soil for inoculating the subse-quent seedings of alfalfa. This utilization of soil from one's own farm avoids the danger of introducing ds and plant diseases from other sections.

Enemies of Alfalfa.

Weeds as might be expected constitute, perhaps, the worst enemy of alfalfa, and among these crab grass probably ranks first. Alfalfa does not make a vigo growth during the midsummer in most parts of the East, and it is during this season of the year that the crab grass and other weeds make their most luxuri-ant progress. Unless there is an abundance of plant food in the soil to produce a luxuriant development of aifaifa the plants are aut to become soon reduced in vitality as to be quable to resist the soon reduced in vitality as to be unable to resist the crowding of the weedy grasses; so much so, in fact, that they may not be able to make a sufficient recovery for the succeeding season's growth. The weeds must be controlled. This is best accomplish by seeding the atlaffs in the late summer or early fall on land that is comparatively free from weeds and has been rendered even more nearly free from weeds by repeated harrow-long; and, second, by maintaining the affaifs in a suf-ficiently visprous condition to that the weeds will be unable to obtain a foothold in the field. In actual pra-tice, it is addition mustakin in the Neart to hold; a readtice it is seldom possible in the East to hold a of alfalfa for more than three or four years owing to the vigorous incursions of the more aggressive weeds.
On limestone soils blue grass is very spt to crowd out the alfalfa plants. On other soils crab grass seems to take front rank among the aifalfa take front vana among the wights elemine. Plant of cases are always preying on alfalfa. These are sup-cially troublesome when the vigor of the alfalfa is a duced by growing in soil not perfectly adapted to it. These are supe-

speing Secoling Versus Late Summer Seeding.
Much money and effort has been and is still being water by water the versus season of the presence the year. dangerous practice. The young plants are of a size growth at first and as a consequence are early crowded out by the more agreeative weeds in the late spiring and early summer. The seading whould take plane the mid-die of August in the latitude of Maryland and Virginia. Every broadwid insign south onlis for the useding to take plane one west earlies, while for every inorder duties south the seading edecadd be delayed for one week. If the land has been playing and frequently insproved for often weeks or two insights before seeding, the plants will frequently produce a giventh of ten to brighty-landness before cold weather. This comparintively heavy

## SCIENTIFIC AMERICAN

BEN'S THE MEMORY OF THE STATE

the the growth of the winter e a rapid growth the next spring, and made resumetances will keep about of the wood contribute chromosome will been sheed of the weeds cittle first crop is harvested. It is not usually possible noiside of the Potenson or Obio civens to curn whelve goods satisfies a copy of the Potenson or Obio civens to curn whelve goods satisfies of satisfies. A crop of early potatoos, however, one sensity so resourced in ample time for the seeding of the sheets. A crop of early potatoos, however, one sensity has been considered and time for the seeding when the contribute of the sheets. A copy of the satisfies since the ground does not require region-ing said, so time is float in waiting for the ground to settle sufficiently to jointly planting.

Envesting the Alfaffa Crop.

Alfaffa free leveral cutting of dring a season. Every cutting should be made just as the crown of basel buds

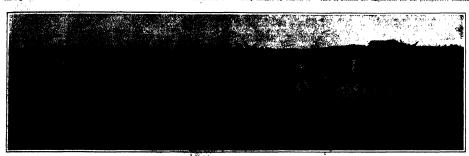
are starting the growth of the next crop. This will usually happen just as the plants are coming to bloom, at which time they range from 14 to 40 inches in height. The hay should be cured without shattering any more of the leaves than is ashoulted necessary. The leaves are by far the richest part of the feed and every effort should be made to retain them. The hay is raked into windrows as soon as the leaves are well withed and before they get a ofty as to shatter. The hay should lie in the windrow until the leaves are dry and the stems still green, whas it should be piaced in shocks and allowed to cure before being placed in the barn or stacked.

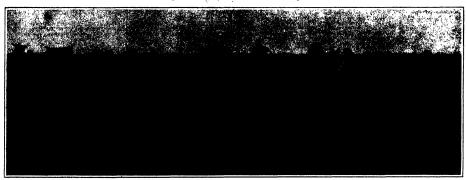
Value of Alfalfa for the Dairyman.

Alfalfa is a triend of the dairy farmer by reason of

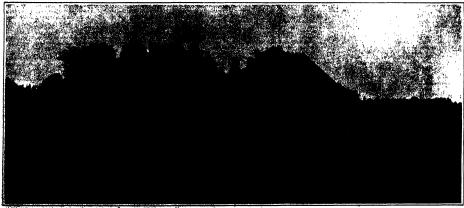
the marked effect of alfalfa hay on the production of both milk and butter, and also by reason of the excel-lent effect of the manure from the cow stables upon the growth of this really wonderful forage plant. It is for dairy farms especially that this crop is recommended in the Eastern States. Here, with an abundance of good barnyard or stable manure, the fertilizing bills are greatly reduced, while the cost of concentrates, which usually est into the profits of the dairy farmer, is reduced to a minimum. With plenty of alfalfa hav for feed it is usually unnecessary to feed any of the high-priced concentrates in order to maintain a profitable flow of milk throughout the year

The following ten commandments regarding the cul-ture of alfalfa are important for the prospective alfalfa





culation is necessary. Here the harrows cover the soil from some old alfalfa field before the sun's rays can harm the germs.



Alfaifa haylender at work.

. . .

grower to consider. Don't fail to provide to ample insculation; soil from a healthy accel-free alfalfa field is best. Don't sow on a vecel-free alfalfa field is best. Don't sow on a vecely soil. Don't sow on any but a sweet, well limed soil. Don't sow on any but a finely prepared, well-sattled seed bed Don't pasture the first or second year. Don't lose the leaves, they constitute the best part of the law ten, they constitute the best part of the law ten, they constitute the seal alrage to begin with. Experiment on a small area first Don't give up. Many prominent alfalfa growers finally succeeded only after many failures.

#### Pedesis in the Metal Uranium

RECENT discoveries in regard to the monoments of the sliphs particle in radioactive substances have awakened a new interest in an old phenomenous, pedesis, or the flows and movement. In the pollon grains of plants there see time granular particle scaled forced which are effect when the called forced which are defected by the pollon is crushed. An old that movement which oughtably was believed to be analysing organic to the motions of the appearance of the appearance of the motions of the appearance of the

But in 1827 Dr. Robert Brown observed that many inorganic substances in a fine state of trituration similarly behave.

The movement is chiefly of an oscillatory nature, but the particles also rotate backward and forward, on their axes, and even dart above the field with a rapidity de-pending, of course, upon the power of the objective Painnes stone, kaolin, gamboge and finely divided clays show the phe-nomenon very well, but they must be finely powdered, preferably in an agate mortar Particles greater in diameter than 1/5500 of an unch are mactive, and it may be said that as a rule, and other things being equal, the finer the particles the more distinct the movement, which is about 1,5000 of an inch at each bound. Of all substances, and the writer has tried hundreds, the metal uranium shows the movement most distinctly, and in a manner almost spectacular Pure uranium should be used, and pounded in an agate mortar for 15 or 20 minutes, or at least until many of the es are reduced in diamet 1:10,000 to 1/20,000 of an inch. Put on a slide a quantity of the powdered material, equal in bulk to a mass 3 or 4 times the head of a pin, add a drop of dustilled water with a trace of gum arabic, and observe with a 1/12 oil immersion objective. The whole field seems to quiver with life, and the finer particles dart from point to point with a motion strikingly analogous to that displayed by many micro-organisms.

When the film of the material is of

When the film of the material is of proper thickness and the particles sufficiently reduced in diameter the phenomenon is beheld in a perfect abundon of color—the reds and blues being of metallic brilliancy.

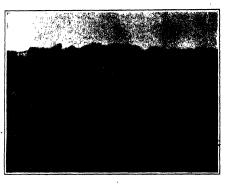
The result will well repay one for the effort expended in reproducing this experiment, and, once seen, it can scarcely be forgotten

#### The Utilization of Atmospheric Nitrogen

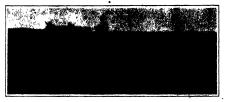
THE unrestance of untrogenous compounds to the sarrentium and industrial interests of Europe and Amories has present the transport of the sarrentium of Manufactures to the sarrential transport of the sarrential transport of the sarrential transport of the sarrential transport of the tenties, one of the most pressure of the tenties, one of the most pressure of the tenties the century, is unique from the fact that the material is infiliated. The atmosphere introgen above one square mile of land, amounting to about 22,000,000 tons, is equivalent to what the world would require in the next fifty years at the present rate of consumption. The problem is to utilize this introgen conomeally, and thus free the world from its dependence on the interest deposits of Chile, which are not particularly extensive and are likely to be exhausted at a comparatively early date. Remarkable results have been obtained in Norway by means of electric furnaces in which atmospheric nitrogen is oxidized to the form of nitric oxide, which is used in



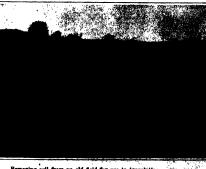
Large hay forks unloading aifalfa a quarter of a ton at a time.



Crimson clover is often used to turn under for enriching the land and bringing it up to alfalfa pitch.



The use of large side delivery rakes leaves the fresh cut alfalfa in shape for the haylonders.



Removing soil from an old field for use in inequinting a mire one.

pushing abdoms process. The second of the process an important frield Calls, stilling the second of the process of the process

#### Open-air Schools of Paris

IN the schools of Paris and other large edities the statistics show that there are on the average 10 per cent affected with tuperculosis, and although this may yet be in the latest state there is most the less a considerable danger for these persons for the future. Open-air cohools are advocated for preventing the disease, and Messen Fortunester and Bernheim treated the question at the recent Tuberculosis Congress, stating that children as hiftened and the greatest besenft from their stay in such schools without suffering any drawback to their instruction. In the suburbs of Berlin a method of this kind is carried out in schools where the pupils are not todged in the buildings. A type of bearing school is found in the suburbs of Pasis, and the children are first examined so as to find out how long a time of stay will be obsenft to them. They are divided into benefit to them. They are divided into spends according to their condition, and are also treated for defects in hearing or in the respiratory passages. The main treatment is a rational method in whole open-air work and physical exercise play the most important part. Figures show that the results are excellent, and among the 800 pupils passing through the Vesinet school for the last two years, a great number starting from very bad health conditions recovering great benefit from even a few weeks stay in the open-air work).

#### Uses of Seaweed

SOME interesting facts about serveeds which are used as food or for producing velocitable gelektines or glues, are brought out by Messrs. Perrot and Gestin in the annual of the French Oceanographic Institute. Seaweeds are not much used in Europe except for cilcules or iodine preparation. In the north coast regions of France has executed in used by the peasants as a manure upon the fields. Medical uses can be mentioned, and the variety called Institute. Seaweed is used by the peasants as a menurous that the season of the season is mentioned, and the variety called Instance of the considerable extent, this reaching 20 tons of day saweed in 1904. One variety of seawed is a vary good vermifuge, and is extensively used for this purpose in Corridor. On account of the iodine which they contain, some seaweds, are remedies against and servicule. As no food uses, this seames to be introduced by the proper population communication, some seaweds, are remedies against and servicule. As no food uses, this seames do be introduced by the proper production of the iodine seames of the introduction of the control of the control of the control of the production of the control o

# Wholesome Water in the Country

The Dangers of Pollution and How They May Be Avoided

By Frederick H. Billings, the Associate Professor of Bacteriology at the University of Kansas

TYPEOP, PREDERICX H. BILLINGS is a man of La considerable importance in masters relating to make viamelia, the handle been a part of the cord in Scale viamelia, the handle been a part of the cord in Scale viamelia, the handle been a part of the cord in Scale viamelia, the handle scale viamelia and handle chopy in the University of Handle Changes (1876) and at the consisty scale indicates the Chemses, 1877, and at the conting station is to be head of this department, He content to the Chemses, 1877, and Fh.D. Menich, 1901. He has been hosteriologist to the Department of Water and Smage of the Enness State Board of Water and Smage of the Enness State Board of Water and Smage of the Lances State Board of Water and State Deart of the Water and State Deart of the Water and Smage of the Lances State Board of the Water and State Deart of the Water and State Deart of Technology, scheme because of the May State State of the May State of the May State of the Water and one in delaying at the University of Visconskin.

Al present he is at the Messachuscite Institute of them, On the return to Kanaal, besides he condended white the toll session high responsibilities in the care of the State State on of the State and and the Conference of the State State on the State State of the State State on the State State of the May State on the State State of the State State of the State State of the State of the State of the May State of the State State of the S

of the Stote Analysis of Water.—Extract,
From very remote times, a good water supply has
been considered one of the greatest blessings since the
sight of Issac's becksome for the wells of Gerar down
to present-day irrigation. Its possession has been subbect to contention. Possibly good water was of more
frequest occurrence among patriarchal tribes in their
nomatics life than in our modern settled habitations.
At all events, the growth of civilisation has pressed
upon us the problem of combating the
contamination of water supply.

How the Quality of Water is Judged.

The quality of water has generally been pludged by its degree of sparzike, of turbidity, of ceaperature, and, since the increduction of son, of hardness. These standards have their value, but they are considered by sanitarians to be superial characteristic for determining wholesomeness. Water may be hard, warm, fat and turidd and yet be safe to drink. It may also be soft, cold, clear and sparking, and still carry infection. Wholesomeness depends upon comparative absence of sails and organic matter, deleterious to health. Injurious sails, while inducing disturbances the sail of the sail

of a more of less discomforting nature, even causing permanent injury if long-continued, do not create such serious consequences as polluting organic matter, especially if this takes the form of pathogenic micro-organtums.

It is believed that decaying animal refuse, deraining from garbage heate, barnyards, piggeries, manured fields, compools, priry-raults, and the like, may occasion sickness when it finds its way into a water supply; but an equal degree of danger does not exist in all of these sources of fitth. Animal manure and garbage are in a class by themselves in that they, are not liable to contain the perma of disease that would procue infection in man through water. Cospools and priry-raults are in another class, since they are open to infection by bacteria particularly pethogenic for man. Water containing such germs assumes its most messeding appear, especially if under the limidious guide of a cuid and sparking beverage.

it would be destrable, of course, it every source of water apply could be examined by a sauttary batteridopiet in order to determine the liability of contentiation; but so kings is the task that the solution of the question in many instances must be left to the institution; but the best to the institution of the question in many instances must be left to the institution of the question in many instances must be left to the hardy of the contention of the course of the solution of the contential of the contential of the content of the content

sinds lodgment in pitty-vaults, essepools, or on the ground, fress skept of which, permeations or weshingscontaining Hyding beefill may find their way into some water supply. As the specific germ of typhoid is known to essanate only from infected persons, who constitute but a small percentage of the average commult; the majority of country water supplies, even though otherwise contaminated, would be inexpable of creating an outbreak! of this particular disease. Typhoid, moreover, is not limited to water as a means of transmission, for contact and infected food play their part. But, after all has been said, it still remains true that water has often been a serious source of infection, causing numerous epidemics and disantrous loss of life.

The Water Supply of the Average Man.

The average man, when confronted with an adverse analysis of the water supply, is liable to be surprised, declaring that it is the best in the country, and that it has been used for years without producing illness Granting that he be right, immunity in the past is no garanty, underconsistly, for the present or future. In his case, some connection has evidently become established between well and outbouse or casspool, and apparently he has not happened to harbor a typhold-infected person on the premises. There is nothing needed now but the carrier of the specific organism to begin the trouble.

Rural water supply is generally obtained from springs, wells or cisterns. From a sanitary standpoint, springs and deep wells—deep in the sense of

point, springs and deep wells—deep in the sense of pect good re

Diagram lithistrating relations between water supply and sewage disposal in the country.

a. Stable with adjacent well, listle to contamination from surface westings and ground scoping. A Bosine with seware drain to the nutries. Byforing in desper of contemination from drain just above. A Bosine with preparty placed world and outflouise. A House with respect placed with ground, but because of adjacent formation, the well is listle to contamination. The well at house p is in little danger from the cosponences of the intervening impreyious stratum of earth or rock (f. 6), an impervious stratum of earth or rock (f. 6), an impervious stratum of earth or rock (f. 6), an impervious stratum of earth or rock (f. 6), an impervious

posstrating ission the first impervious stratum—are the most resistate sources. The usual excellence of these, and, in fact, of all good ground water, is larnely due to the filtering property of the soil. Suprine, septicially those flowing through fissures, and deep wells resp the benefit of prolonged filtration through earth. But both may be subject to contamination, particularly springs, which are often open to surface washings from sewage-drains, and the life, icented farther up the slope. Hence it is advisable to inspect the watershed above a spring; also, to guard it from the surface washings by a wall or ditch.

The Danger that Larks in a Badly Located Well. Driven wells and dug wells reach only to ground water, differing in this respect from many springs and ildeep wells. Their shallowness brings them at times into proximity to decising from privy-waitis, cesspools or leaky drains, and anyone sinking a well near these sources of filth must redy upon the filtering action of the soil to remove pathogenic bacteria. The filtering efficiency of the soil, in serving to protect wells from contamination, depends upon such factors as the extent and the nature of the intervening soil and also upon direction of ground-water drainage. The distance that should exist between a well and a source of pollution is, because of these, so sgarable, that probably no definite rules would be transferred in the greater the distances the better. Nevertheless, from eigenfancts conducted by the writer for the purpose, eigh harder foed was found to be the least distance would be incention of encountering or cetabilishing direct feliciation, through creak or passages in the substite. Employing a well, moreover, lowers the water covering height, as a capter. Contaminating matches at the probable passage is a static of the probable of the static covarial mixtunes from the storest of the substite passage in the substitute of the passage in the substitute of the probable passage in the substitute of the passage in the passage in the substitute of the passage in the passage in the substitute of the passage in the pas

within the coeffici of the now triventy the weight of the property of the control of the property of the prope

ter to locate a well on higher ground than a cesspool or outhouse, it is also prudent to have a safe distance intervening as an additional precaution.

Driven and day wells, though similar underground in point of possibility of contamination, diffice materially when danger of surface pollution is considered. Driven wells are comparatively secure, while day wells, open above, or covered with loose boards, through which fifth may sift, or else with low and defective curbs, invite every sort of objectionable material that a may fall or weak in. For this reason, day wells are responsible for a greater extent of (sphold infection than any other source of rural water supply.)

Claterius, if underground and near leaky drains, ceasepools, and the like, or a capsed to conditions similar pools, and the like are a low attentight, and few of to to wells, when they are not water-tight, and few of the them are in the South, where mild winters prevail, and clateria see usually abouter ground and are, therefore, clateria see usually abouter ground and are, therefore, and on subject to Both kinds, however, are resulted by roof washings, which, if not allowed to runillied by roof washings, which, if not allowed to runtor water at the step and the storm, any carry refusetor to waste at the storm, and carry refusetion of an undestrable though not infectious kind. Clateria water has been water hand to relate for yielded for liphoid, but it is not so probable a source of dance in this reward in the probability of the probability of

Finally, it may be said that the maintenance of wholesome water supply of any kind requires constant watching. To dig a hole to water anywhere and expect good results forever afterward, is unreasonable.

With the exercise of common sense, bused on the knowledge of ordinary sunitary principles, a person should live in comparative security from water-borne dis-

#### Plants and Tobacco Smoke

PROF. MOLISCH, the plant physiologist of the University of Prague, has shown in some of his earlier work
that large numbers of micro organisms,
plants as well as minmis, and the seedlings of histor plants are extremely sensitive to the Influence of tobacco smoke,
some being even killed thereby. Many

some beling even killed thereby. Many of the detections effects experienced by plants living in absortance were formerly attributed to the small quantities of liminatining ass which frequently vitates the atmosphere of such rooms, but Molischie experiments left no room for doubt that it is really the to-bacco smoke that does the harm. His pictures showing the growth of pea and verth seedlings in the presence and in the absouce of tolineco smoke are very striking.

In his more recent experiments he used older plants of various species, including species of spiderwort, Boherveta, Eugatorium, scientific, and others. None of these plants showed any ill effects from the treatment, although expassed for a long time to an atmosphere filled with tobacco smoke Other plants, however, restonded in various striking ways.

power niner that nonzero smoote other pannes, nowwer, responded in various striking ways. Brekmeria utilis and Spituto-bera bitola changed their names of growth. When pinced in a large bell jar and a few puffs of smoote from a clear or eigerette were blown in, the leaves of these plants, ordinarily growting action, handless of the steam, but is, in a borigrowting action, and the steam of the plants of the course of from 24 to 48 hours, until they were in a vertical plane. In the case of the Brekwerns they continued their rotations beyond this plott, describing a spiral. Similar disturbances were produced upon these two plants by illuminating gas. But other plants used in the experiments showed similar effects of tolkers smoke, but did not resoond to the lilluminating gas.

Earlier experiments showed that various marcotres provide abnormal development of the breathing holes on the shoot of the potato. Experiments with tobacco amoke on the potato and on other plants led to the same results, often with the accumulation of masses of liquid under the swellen areas.

In some plants of the bean family, the tobacces smoke caused the leaves to drup off in a very short time. The sensitive plant (Mimons padica) and the black locust (Robbits pseudoscie) and others lost all or nearly all of their leaves in from 21 to 48 hours after being placed in an atmosphere containing tobacces moke. To a smaller degree smoke from wood and paper, and illuminating gas produced similar results. The fames of nicotine had very little influence.

# Insects and Disease

# The Mechanical and Biological Methods of Transmission

By W. C. Rucker, M.S., M.D., Assistant Surgeon-General, U. S. Public Health and Marine Hospital Service, Washington, D. C.

[M AA in the Stone Age was obliged to earry on an uncersion battle for cristence with ferocloss mammals and eromous servents. Happily those days have passed, but to-day the struggle to live is no less and, but the Auser forms of verytable and assimal life. Insects at the internollary vehicles in the transmission of disease are a memor to the present and plane verifare of the use and yet we will preserve our physical theterity are must live is tisseet-free surroundings. The print for an analysis of the large that the theory was true to the present and plane verifare the print of the verifaction of the large that the throughout the thin the part of the entomologist, the chysician and the sanitarian if the verball compare them damperous and annulary peaks. The burden cannot be horse cattlety, however, by men of science, the edition and more evidence, by men of science, the edition and more evidence and observes, by men of science, the edition and more extended.

of affairs must do his part in the application of the discoveries which mean so much to the individual and the race—Entros.]

The theu of the transmission of disease-producing oraniums to man by insects is no new theorem of the sease-producing oranium to the sease producing the sease producing the sease of the s

In order Intelligently to approach the consideration of this latter day scientific development, it is necessary to understand the way in which the insect acquires the organisms which produce disease, the changes which these organisms undergo within the body of the losset, the way in which they are introduced into the human body, and the developmental changes which take place in them in the course of their attack upon the human yetering.

Broadly speaking, there are two general methods by which this process is accomplished. These are the mechanical and biological methods in the mechanical runninstation of diseases germs by insects, we find the insect in question coming accidentally in contact with diseases producing organizates and carrying them into the body of man either directly by biting, or indirectly as by infecting food, it is not necessary for the life of the kerm in question that it be carried by any particular insect.

No developmental changes, which are of any account, occur in the organisms during the period of this transportation to man, nd therefore we may find many different insects of totally different habits acting as vectors for a given germ. As an example of the mechanical method of transmission, in contradistinction to the biological method of transmission, we have the carriage of typhoid bacilli from infected excrement his files. In this instance the fly smears his feet, probo wings with the discharges of a person who has typhoid fever, and then alighting on foodstuffs there deposits the germs to be taken by some unsuspecting person. In instance no change whatever has been undergone by the bacilli, and they could quite as well have been carried by a cockroach which might similarly infect In the case of the transmission of tul by flies, the mechanical method of transmission still obtains, but it has been determined by experiments that, in this instance, there may be an actual multipli-cation of the tubercle bacilli within the body of the fly and that living bacilli may be discharged in the fly's excreta. In the case of the transmission of plague by the flea, another example of mechanical

transmission, it is not necessary that any particular, succeive of fee act as the vehicle. The field shootsone infected by bitting an animal which has the garms of planue in its blood. The fee imbites this pess-lades material and subsequently bites a human being. It is not by the act of bitting, however, that it transmits the across of this disease. The field has the habit of depositing his excrement at the time of bitting. A person who is bittine naturally suffers some irritation and rubs or scratches the bitten place. In doing this the germs of the disease are rubbed into the skin, which they peachtrate and thus gain entrance to the body. The transmission of maintain is a typical example of

. The transmission of malaria is a typical example of the biological transmission of a disease-producing parasite. The organism of malaria is a small unicellular animal which grows and develops in the red blood cells which is used for extracting blood. It is suffithant the means for this act is a feather to thin the blood which is to be extracted. As the suits as fermir from the giand in which the imputure forms are looked it is infected with them. These bodies thus infrouded into the human system enter the red blood cells, and the person becomes infected with maintain. In yellow free, although the appearance of the causatire germ is not known, thanks to the preliminary work of Finiary and Carter and the conclusive experiments of Reed and his associates, the length of the developmental cycle in man and in the Stepomyer's measure to defend a proper control of the conclusive experiments of the second of the conclusive experiments of the developmental cycle in man and in the Stepomyer's measure to defend and

his associates, the length of the developmental cycle in man and in the Steponysis mosquito is definitely known. Fites may carry the germs of typhoid fever, cholers, vigentery and tuberculosis, and it may be that these ubiquitous household pests may carry other diseases as well. Two varieties are commonly met with in this country, the Mesos domestics or

common house fly and the stable tly or Stomowye osicitrans. Both are bred in manure, and it has been recently estimated that each pair of flies surviving the winter may be the an ght million living flies during the summer Flies are omniver-ous in their habits, and will eat filth of almost any kind. The first thing to do to get rid of flies is to exclude them from the home of man, and this may be accomplished by the use of screens, both as to doors and curately and should be con-structed of some permanent non-corrosive material, such as wire. bronze Inasmuch clude mosquitoes, the screening should have a mesh of at least eighteen to the inch. After this has been done, it remains to de-strey the breeding places of the flies and get rid of those things which attract them. Stables or other out-buildings should be well screened. The should be stored in water-tight metal lined boxes which are emptied at least once to ten days. The frequent addition of chlorinated lime or soaking with kerosene oil will also prevent breeding. Stables sh be maintained in a cleanly condition. The unsanitary garbage can is the fly's paradise. The water-tight metal garbage can with a tight-fitting lid will feed no flies. If the remainder of the premises is kept clean, few of these pests will be seen therein



This is a profile of a fly's head.

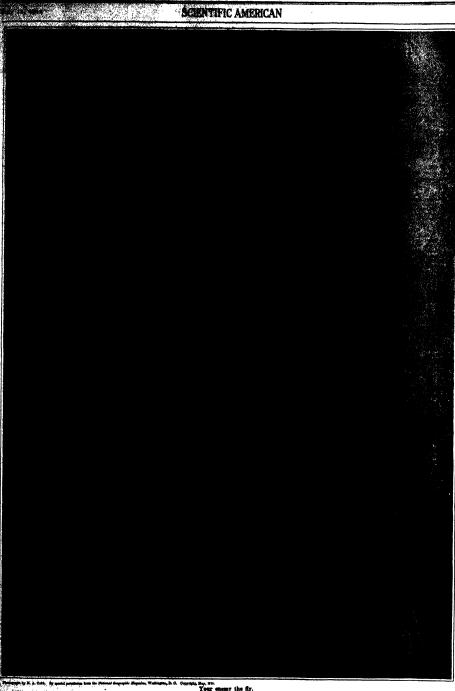
The large area studded with thousands of facets is one of the fly's compound eyes. A fly sem you not eace bu hundreds of times in all angular directions. That is why he so readily compact your downward waveling hand In addition to the facets in he attree simple eyes at the top of his head in the middle, not whelle in this picture

of man and in the various tissues of the Asophades species of mosquito. This germ has two complete developmental cycles, one in the blood of man and the rin the blood of the transpect of the rin the blood of the transpect of the rin the blood of the rin the

Mosquitoes of different species are known to transmit mularia, yellow fever, dengue ("breakbone fever") and filtariasis (the

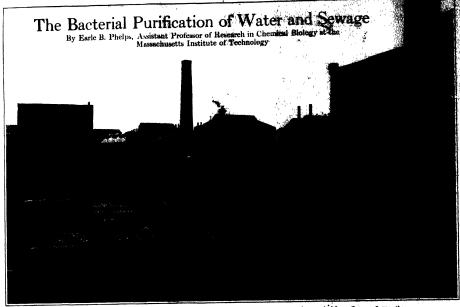
elephantiands which is seen in the tropics). So far as its known, the mosquito type of transmission is biological. More than this, it is also obligatory, I. a. one seneral species only is concerned in the transmission of a cortain disease. Since each of these species has the concerned in the transmission of a cortain disease. Since each of these species has each of the seneral transmission of a cortain disease. Since each it was be said that mosquitoss do not travel far, and lave and the on the premises on which they are bred. The yellow ferrer mosquity being possible of the proposed colopies is a small black and white insect breeding by preference in freshe clean, quick water. It is very senerally distributed in a belt which entired around the world forty degrees on each side of the equation. In order that this mosquito may become indeed, a period varying from cleren to twenty, for scatch, it is now het forty degree on the two processes of the filmers. After having those before infected, a period varying from cleren to twenty, for consulty fourthers days of fail filmers. After having those before infected, a period varying from cleren to twenty for consulty fourthers days of the supportance of the since the days of the supportance of the since the which is croquently as long as one handred days, this

(Osnoluled on page 45.)



To our enemy the fly.

In stations to true class, each of the firs has be accounted with two light-optened story pass. Jeans and spons achieve to these pass and are shous carried from place to place with great rapidity, for the first repression has small for on its over wings, and on one, again and other moving valuies. The by dessas its two carefully shearest they become contaminated, thus passing the classical state of the great that would other who is great. Unfortunately the cleaning operation is not therough enough



Filter beds of the Massachusetts Institute of Technology. Three kinds of distribution of sewage to the surface are shown—the small fountain to the left, the spray to the right, and still farther to the right, the fluted cylinder of the Fidian distributor.

[THE author of this article graduated at the Massa-thehusetts Institute of Technology in 1989, proceedings thence to the Lawrence Experiment Station of the Massa-chusetts Board of Health, where he remained until 1903. In that year he was appointed chemist and bacteriologist of the Massachusetts Institute of Technology in the Santhe Massachusetts Institute of Technology in the Sani-tory Roamet Abnorthery His official title at that sent of technical learning is Assistant Professor of Research in Chemical Biology. He was hydrographic and of the United States (trological Sizewy (1905-1906) and since 1908 has been hydrographic. His special departments of research have been water and sevage purification. He is an expert in the consideration of remedies for the various relie existing in large etitie. In the recent investigation of the publishing of the History of the publishing of the Work. First, Phillips was the sanitary authority connected with the work. He devised plans for the immobiate im-prosement of the situation. He gave Newburgport valuable advers on the subject of its claim falls, showed Providence how to improve the condition of its oyster beds and recom-modeled mans for the purification of the polluted harbor mended means for the purification of the polluted harbor of New Bedford -- Editor |

Water supply and sewage disposal are pre-eminently, though not exclusively, problems of modern com-unity life. Upon the farm or country estate, and in although not exclusively, problems of modern community life. Upon the farm or country estate, and in the small villages, nature provides fairly satisfactory solutions of both Springs or wells, on the one hand, and privace or reaspools, on the other, properly devised and maintained with regard to the elementary rules of health and cleanliness, constitute what may be called the natural solution. With increasing convention of population the messenties of convenience and public health demand more extensive works. Here receives the to what may be called artificial muthods, since they call for special scientific study and engineering construction. Nevertheless, as all science is but the orderly and detailed study of nature, so the modern sevence of water and sewage treatment is but an obsorations. science of water and sewage treatment is but an elaboration and intensive application of the natural process To the latter then we must look for the ele most basic exposition of the principles underlying the bacterial purification of water and sewage.

naccerais purinearion of water and sewage.

The soul has ever been the natural and final repository for the waste products of life. Even the gastous exhalations of animals are captured finally by plast life and ultimately become part of the carbonaccous surface of the land. The soil has a tremendous and apparently inexhaustible capacity to receive and assimilate such wastes. It has been found that if soil be heated a killing temperature this wonderful power is lost. short, the soil, as we know it now, is not the lifeless substance we once thought it to be, but a veritable

living world toeming with invisible things, bacteria, molds, and venats, as well as with larger animal life, worms and gribs. It is this living soil that devours all manner of waste substances, redecing them ultimately to the simpler mineral ash from which they came. "Dust thou art, to dust returnes" could suppose of the body no move than of the soul ware it

spoken of the body no more than of the soul water it not for these great though tiny destroyers. Let it be said now at the outset that this provision of nature is the statting point of all that follows. As the tea-keathe is to the steam turbine: as the kite and key of Frankin are to radio-testgraphy; so it thus living soil to those two greatest achievements of sanitary science, the bacterial purification of water and sowage.

science, the bacterial purification of water and sawage.

Nor is it wise to separate the two as is so often done.

A good water supply is a prime necessity Sewage disposal is the resulting prime duty. To bring a general A good water supply of water into a town without making due provision for its satisfactory removal is but a half-way. provision for its astifactory removal is but a half-way measure that were in many cases better left undeps. Such astifactory removal must always movive shall final disposal of the sewage in such a manner that so injury to the heatth, confort, or property of the out-munity in question or of any other one shall remove the must be the such as the such as the such as the such as now be directed to the method by which a taxatal forese

have been directed and utilized in water and sweage purification. To further emphasize the importance of the disposal end of the system, and because it best lliustrates the principles involved, let it be first dis-

# Sewage Disposal.

The earliest method of disposing of human waste was by burial, and to-day no better method exists. was by burial, and to-day no better method exists. The mirroduction of water supplies led to the water carriages system of waste removal, by which the problem became one of community interest. Removal is not disposal. It serves but to shirt the rappiosibility from the field visual to the control authority; to consentrate the effect from many small natural plants to one large artificial

system. The earliest successful effort to meet this respirational transfer was by "broad tringuisin" or "sewige farming," As early as 1600 the sewage of Bunshai, Princial, which thus treated. This method consists simply in allowing the sewage to flow over large jartes of cultivation hand, where it is absorbed and utilized its a-manner estimate analogous to the utilization of macrows. At Butting, analogous to the utilization or manuse. At Bellin, the chief of the one employing this method, over 45,000 horse of land are utilised.

The comparatively large areas of land necessity, coupled with certain objectionable factories of the pre-

coss, such as offensive odors and the possibility of dis-seminating disease by means of files or through the crops, have caused irrigation to be viewed with less favor now than formerly. Even in those places where it is most extensively employed other methods of treat-ment are gradually being introduced. From the broad irrigation field to the modern trackling direct progress has been along the line of more intensive action and consequently smaller areas. The Berlin dieth nourides na error of land for saver hundred people.

filter progress has been along the line of more intensive action and consequently analice areas. The Berlin fields provide an acre of land for every hundred people. In the next type of works to be developed the rate of treatment was increased ten-fold. This was the so-called intermittent slow sand filter which may be defined as a specially prepared irrigation field. It is distin-guished from the latter in that it is either constructed guaren from the satter in that it is cleare considered upon analy areas by the laying of underground drains, or else built up entirely of sand brought from some outside source. Frops are not as a rule raised upon sand filters, and higher rates of application of sawage are therefore possible. Sand filters of this kind can be

are insertors possible. Seam interior or this kind oan he made to purify sewage to a drinking water standard. The use of the term filter is unfortunate, It is hard for anyone who has not especially investigated this matter to appreciate the real blodgerial extrity of such a sand bed. In the popular mind the action of straining is always. most important, although in reality it amounts to little or nothing. There is, of course, a certain amount of materias which will not pass into certain amount of materna which will not pass in the said, masther, paper, fiber, etc., and this has be raised from the surface occasionally to allow it access; if the in. The owner, it is sorbed and cuttienty purified within the sand bed, cuttlend being control of the control of the process which takes place slowly in a mastured it is carefed out on a lonce intensive scale in a slow is

Siling siling buy, with these included they are made of including wavage at a rain fully ten-fold that are said of including wavage at a rain fully ten-fold that are said of including wavage at a rain fully ten-fold that are said filter. Sinch a contant but brands to accumulate the said of the

as rases awe or turee triple to that are possible in the contact filter, so that as a result of 25 years' study the sewage of 25,000 inhabitants can now be disposed of upon one sore of land, whereas in the old irrigation fields one hundred persons was the safe maximum for the same area. This improvement in rate has not been This supprovement in rate has not been secured without some sacrifice. It is not practicable to secure the perfect results of the sand filter in the rapid processes necessary for large communities. With the increasing rate there has been a decrease in the quality of the purification of the same of the sam tion, especially as regards bacteria. The primary function of purification, oxidation of the organic matter, is performed satis-factorily, so that for the protection of streams and larger bodies of water these streams and inger sources or water these methods would suffice. But the effluents or outflows are not eight and attractive and the bacteris have not been satisfacand the electric lave not been satisfac-torily removed. From a public health point of view, therefore, much is still desired in sewage purification. Fortun-ately, the investigator in sanitary science has been equal to the occasion, and means of chemical disinfection have recently en developed which effectively supp oxidizing methods. But chemical disinfection is not strictly a bacterial purifi-cation and lies aside from the immediate o of this discussion

s septic tank and its many modern modifications are important in a con-sideration of sewage purification. These are the offspring of the old-fashioned cess-pool, but the modern development is as far removed from the original device as is the trickling filter from the irrigation field. In a septic tank the biological action is very different in character from action is very different in character, from that which we have considered. Instead of oxidation with an abundant supply of air always present, we find here an anaero-ble condition, that is a working without oxygen, and chemical 'reduction. The natural effect of this action is the rapid solution of solids along with certain other chemical changes, and the liquid thus treated can be discharged upon filter beds of the various types described at even higher rates than would be possible with untreated sewage. Thus, the septic tank and its modern successors, the biolytic tank, the Imhoff tank and all the others,

and its modern successors, the biolytic tank, the finnel fank and all the others, are preparatory treatments only.

Just as my have seen how the science of sewage purification employs those very principles by which the soil in nature brings about the ultimate destruction of organic matter, so in the field of water purification was again look to mature for our methods. Despite the obvious fact that the earth is the final reportery of all things that have ever lived, both satinal and vegetable, and that its surface is literally, expected with organic material in the process of sizeas to the minorial world, yet waters issuing from this provide of the process of sizeas to the minorial world, yet waters issuing from this provide and the process of sizeas to the found of the process of sizeas to the found of the process of th

must be some ample purifying agency. This agency is found to be come more the living earth which has been so frequently referred to. If, now, these natural resources can be developed and intensified so that they may be utilized in artificial structures for the purification of water, the problem of a pure water supply will have been solved. This is exactly what has been accomplished.

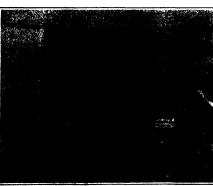
Artificial beds of sand only a few feet in depth, carefully prepared with under-drains and properly operated to secure the maximum efficiency, constitute the sand to secure the maintain encetor, comments to the filters upon which so much reliance is now placed in the purification of city water supplies. Within these beds the bacteria find lodgment and increase enormously



Winter difficulties of a filter.



The sprinkling filter and sand beds at Burlington, New Jersey.



The Picture distributor, which appears in the hea so of this article but revealed more in detail.

in numbers. The organic matter contained in the water, constituting its impurity, is seized upon by these small organizate and is transformed by them into harmless mineral residue. Rates of flittkiton are so rapid that in most assess there is also, insidentially, surface accumination of sletchic composed of solid impurities in the water. This stgarling action is oftentimes regarded as an important facetic composed of solid impurities in the water. This stgarling action is oftentimes regarded as an important specific in the work of these filters. To a certain extent while years in the work of these filters, To a certain extent while years in the work of these filters in the carried of the size of the properties of the work of the properties or by other unfavorable conditions, the efficiency of the differ similarles at sone. When conditions are most flavorable for biological sativity, efficiencies are at

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their highest. A simple calculation will show that the size of the sand grains is to that of the bacteria about as the size of an apple to that of a bird-shot, and illustrates how futile would be any attempt to strain out bacteria from a polluted water by mere passage through sand. How much more impossible would be the removal by straining of dissolved coloring matter, the dimensions of which are molecular. Yet both bacteria and coloring matter are removed in a well regulated rand

The so-called "mechanical filter," developed largely in this country, is a very different mechanism

in this country, is a very different mechanism. It is operates at a rate about fifty times as great as the permissible and filter rate and is purely mechanical as on the section. For this purpose sand is seen on the section, also comployed, although a coarser grade preferred Before passing through the sand, the water must first be treated with a cuitable countries the treated with a suitable coagulant, alum being com-monly employed. The alum enters into hanical combination with certain natural constituents in the water, gath ing together all fine particles of suspended ing together an ine particles of suspended impurities and to a large extent absorbing dissolved impurities, such as color and odor producing substances. After the water has been coagulated in this way, t is allowed to settle, and is passed finally through these rapid coarse sand filters at a high rate. The filters strain out the a mgn rate. The fitters strain out the remaining alum prespitate and the result is clear water quite free from bacteria and other impurities. This process is not truly bacterial purification, but it occupies an important position in American The early objection to the of alum in the water has practically disappeared. It has been learned that und proper management it is impossible for my alum or any resulting compound to

These two types of water filtration have quite distinct, although at times overlapping fields of usefulness. The slow overlapping tieds of uscrumers. The six-sand filter is especially adapted to the purification of sewage polluted waters where the removal of discuss-producing cteria is the object sought In this field they seem to be distinctly superior to the mechanical filters. The latter are of especial value and even indispensable with waters that are highly colored or that carry clay or mud in suspension.

The most recent development in purification, and one which has come into very general use within the past few years, is the so-called "hypochlorite treatment." This also is a purely chemical treatment and may be used either by itself or in conjunction with some filtration process. Its sole object is the destruction of diseaseproducing bacteria Clear, colorless waters producing outcomes waters that are only slightly polluted lend them-selves admirably to this treatment with-out filtration. Waters which have undeout filtration. Waters which have unde-sirable physical characters, color or muddiness are not improved thereby. As an adjunct to mechanical filtration, which, as has been stated, is not alone best able to deal with bacterial pollution, this pro-cess is most valuable. Its great economy and its simplicity of operation and excel-lent efficiency commend it highly. Its value is indicated by the fact that although it has been in use but a few years, it is now employed regularly by most of the large cities of the United States and Canada and by many hundreds of the smaller communities. There is a similar objection raised against this process to that which was raised in the case of alum, but this is bound to be short-lived. The time is is bound to be short-lived. The time is fast disappearing when people are going to let weak, sentimental ideas of so-called purity stand in the way of real sanitary

and economic progres. Man is frequently able to improve upon nature's work. Pure water is an ideal, but as between purified and unpurified water, even though the former involves the application of a dism-feetant, the common sense of the community will not long hesitate. However we may reverence the ideal of purity, we will not take long to choose between disinfectants of well-proven harmlessness on the one hand and typhoid fever germs on the other.

The Problems of a Country Estate.

are rrootens of a Country Estate.

Thus far we have discussed water and sewage purfection for large communities. It is here that the problems are most intense and that their successful solution means most for the welfare of the people. (Continued on page 44.)

# Sewage and the Farmer

# A Problem in the Conservation of Waste

By W. T. Sedgwick, Sc.D., Professor of Biology and Public Health and Director of the Sanitary Research Laboratories and Sewage Equipment Station, Massachusetts Institute of Technology, Boston

PROF WILLIAM T SEDGWICK needs no introduction to those conversant with the story of public Latton to those conversant with the story of public behalfs detection and its moments in the United States. Born at West Hartford, Conn., he graduated from the Shefield Scientific School, Yeal University, in 1877, with the degree, Ph.B., guannap Ph.D. at Johns Hopkins in 1881 and receiving Hon.Sc.D. from he almo mater in 1880. He was nativator of physiological chemistry at the Shefield School in 1877 to 1870; fellow and assistant biological at Johns Hopkins in the latter war, coming to monopist at Johns Hopsins in the latter year, coming to the Massachusetts Institute of Technology in 1883. Here, from assistant professor, he has risen to Professor of Biology and Public Health and Director of the Sanitary Research Laboratory He is the man who established at the Institute more than twenty-five years ago the courses in hology, inter developed into public health work. So successful have they been that the graduates are directing successful have they been that the graduates are directing large annitary works in many parts of the country Wherever there is an important question of pollution of water supply, or the discussion of conditions unducing infectious disease, he is certain to be consulted. He was one of the Experts named by Pitteburgh to investigate the typhoid outhreaks in that city. He and his graduates, Winslow and Whipple, constitute the non-medical portion of the New York Typhoid Fever Commission

New fort Typhout Feer Commission
In an age when popular enthusians is seizing on
fragments of scientific truth and magnifying them till
they overshadow and observe the fundamental and important facts, he has opposed the present crace for "suchting the fig." which all best is only warring on a symptom
and neglecture the disease or destangent the neglecting the disease, or destroying the danger ana neglecting the aisease, or destroying the danger signal, while yet the danger exists. In these later years Prof. Sedgrack has shood sturdily for conservation. He is apposed to the wholesale destruction of foods because they are merely of inferior quality, and betteen that Tovernare merely of injerior quanty, and contenes and voveriment supermann should preserve and make agle such
products. This has brought him into disagreement with
some of the Concernment methods. His present article
is in the line of conservation of sewage, which is everywhere turned to worste, but which has in it caluable elements for some of the industrial or agricultural processes.

The farmer is always seeking for fertilizer for his fields and crops It seems therefore at first sight as if wage of our towns and cities ought all to be carefully collected and turned back upon the farms that feed them The farm feeds the city, why should not the city, plus air and sunlight, feed the farm? is very old, yet it seems forever new. Chemistry con firms and enforces it, for nitrogen—that wonderful element, which, in its virgin state, seems so indifferent, so inactive, but in its compounds so full of energy and so much alive-nitrogen flows alike from sea and lan from fisheries and from farms into those living whit pools which we call cities, there to revolve for a time and finally to be expelled, largely as sewage, in new chemical combinations, lower and less potent in the scale of energy, but still highly favorable as food stuffs for low plants and animals

Some such reciprocation between city and country there actually is. The manure of city horse stables is carefully saved and sent back to the farm. Garbage is not infrequently likewise saved and sent back to piggeries in the suburbs. The earbonic soid gas given off by human beings, animals, plants and by the great fires and furnaces of cities iningles with the atmosphere and helps to maintain that mighty reservoir of carbonic acid upon which the green plants of sea and land draw for their raw materials for manufacturing starch and sugar and cellulose -three of the most important elements of human life and industry.

# How We Waste Nitrogen.

But water and the mirogenous wastes of cities are not often thus returned -at least not directly often they are emptied as sewage into rivers or harbors or the sea, to mingle there with larger bodies of water which latter material returns to the farmer only after evaporation or distillation into the atmosphere and ondensation as rain or snow or hail or fog or dow

consensation as rain or show or hail or fog or dow.

As for the introgen of the sewage, this comes back
but slowly, if at all, and chiefly in fish, shelifish, seaweed, and other familiar products of the sea, so that
there is nowaday a steady and a heavy frain or nitrogen away from the land and into rivers and the sea. The
stress this is the set of the stress of the sea. gen away from the sand and into rivers and the sea. The same thing is true of phosphate, and probably to a greater or less extent of the other elementary substances underlying plant and animal life. In short, there is

day a constant sapping of certain indispensable land to the sea, and only a limited return of these sa-elements from sea to land. To some extent this dr ecements rrom see to land. To some extent this drain upon the resources of the land, and that means of the farmer, goes on even in an uninhabited region, for the ground waters which go to feed the streams, and which in dry times make up a very large part of many streams, always early more or less aftengen. So, too, there usuages, even from a surveices only, and from a prairie when the

aways carry more or sees arreagen. So, too, there essapes, even from a seweriess city, and from a region where the ennexts of human beings are carefully collected and used in agriculture, through the ground water which comes from such regions, much gen in the form of nitrates.

But undoubtedly the heaviest loss, the greatest drain, comes with the sewerage of cities and towns, and the quick discharge of solid streams of sewage directly into rivers or the sea without any previous contact with the earth which, like a mighty sponge, would hold the sewage for a time and give opportunity would hold the sewage for a time and give operations for chamical changes followed by absorption and assimilation by plant life. Under this, the modern, system the draining of nitrogen and phosphates away from the land is rapid and continuous; and it is no wonder that great scientists like Sir William Ramsay are giving subjects of "nitrogen exhaustion" and "nitrogen anxious consideration.

# The Farmers' Interest in the Sewage Que

But if the sea is just now the gainer and a kind of nitro-gen accumulator, ought not the fish to benefit and mulgen accommuner, togath or the last or content and mu-tiply exceedingly? And, on the other hand, if all sewage should be used in agriculture and our fishing continue or morease, would not the sea soon be depleted of nitrogen, increase, would not the sea soon be depleted of nitrogen, and the fishtree disappear? This is an interesting ques-tion, but one which we need not try to answer here. What we are trying to do is to learn what is the farmer's uniterest in the sewage question, and that means: How can the farmer best secure the return to his lands of the on and phosphates which he sends to the city but which the city after using fails to return to him?

The easiest answer is that he should have the liquid wastes of the city at his disposal as he already has the wastes of the city at his disposal as he alvazay has the atmospheric wastes and (sometimes) the garbage and the stable manure of stites. In other words, that the sewage streams of cities should be poured, not into rivers or the sea but upon the land, where their precious elements would not be lost or wasted but made over by plants into food for man and beast. This is the simple ideal solution of the complex of the complex of the complex of the complex of the description of the complex of the comp of the sewage-conservation problem and of the prospec-

# tive difficulties of the farmer. The Effect on Fish of Withholding Sewage.

But it should be noted in passing, that this plan, per-fectly carried out, would very likely seriously deplets or at least damage our fisheries, since fish life is rich in nitroas least camage our maneres, since as he is ren in intro-gen and the amount of nitrogen in the sea, though im-mense, is not unlimited. Moreover, the theoretical way out is beset with many practical difficulties. The works of these is the seasonal and climatic difficulty. Swange is a constant, daily product of urban life, and must be disposed of daily and even hourly, rain or shine, in sumdisposed of daily and even nourly, rain or since, in sum-mer and winter, in wet weather as well as dry. But the needs of plant life are not thus constant or perennial, but highly variable, according to season, climate, tempera-ture, rainfall and many other conditions. There is thus this difficulty: If sewage is to be disposed of satisfac-torily to the community which has it to get rid of, it must be taken away by river, sea or farmer completely and uninterruptedly; by night and day, summer and winter,

This requirement is easily met by rivers or lakes or the sea, but not by the farmer, at least in regions of marked seasonal variation and considerable rainfall, for ant times his crops, simply cannot and will not absorb any additional liquid, however nutritious. Hence the sewage at such times must flow off unpurified and liable sowage at such times must how of unpurinct and hash to create a nuisance, while the crops suffer from excess of water. In the arid or the semi-acid regions the farmer may perhaps at all times and all seasons welcome the arrival of the sewage stream upon his land, for irrigation

arrival of the sewage stream upon ms sand, for irrigation with sewage ought to be the best and most successful form of irrigation in such regions.

It is certainly a significant fact that very few, if any, successful swarpe farms exist to-day in the castern part of the United States. The subject of sewage disposal less en agitated in America for about twenty ye and during these years the problems of extended and improved agriculture have been studied as never before in this country by the U. S. Depar in this country by the U.S. Department or agreement and by the Agricultural Colleges and Experiment Sta-tions of the several States; and yet it remains true that there is not one important example of extensive and sucthere is not one important example of extensive and wea-comful savage farming in the populous and urban Essi-cen United States. On the contrary, New York, Boston, Philadelphia, Baltimore, Washington, and many issuer seaboard cities pour their sevage into the ess, within Chicago, Clevaland, Milmushos, St. Louis, St. Paul, Minneapolis, Cheinnati, Louisville, and many minor cities of the interior empty their savage into rivers of lakes connected with the sea, so that the farmers nowhere recover from these cities the elements which they co tribute to them.

The reason for this common practice is plain. It is easier and cheaper to secure quick, convenient and constant disposal of the huge volumes of sewage which our cities must get rid of, by the means actually adopted than by disposal upon land. And yet, if the sewage of Boston could be carried to Cape Cod, or that of New York to the sands of Long Island, Philadelthat of New York to the sands of long Baland, rangeou-phis's to the Pine Barrens of New Jersey, or that of Baltimore to the sometimes poor and thirsty soil of the Eastern Shore of Maryland, then might these compara-tively desert places be made to blossom like the rese. But even so the fish of the sea would suffer, the gardens of the coean being robbed to feed those of the land, Perhaps we have here only one phase of a world-old dilemma: the land rising solid from the sea only to be dissolved in rain and carried back to it in aqueous solution; the elements then picked out from the solution by plant and animal life, thoroughly deposited in shells or skeletons, and at death added together to make once the solid earth.

It may be that if we do not use our sewage upon the It may os that it we do not use our sewage upon use land we shall by and by be driven to seek our food more and more within the sea. The Japanese and the Chinese eat not only fish but seaweeds, and it would be strange indeed if Americans likewise should give up the land vegetables of to-day for the sea weeds of to-morrow.

# Objections to the Farm Use of Sewage.

From the sanitary point of view the utilization of se age in farming is open to some serious objections. the first place, the mere fact that sewage is brought to the farm at all, means that disease germs and paras may come with it to places and persons previously free from access to a contact with these undesirables. In the second place, owing to the difficulty of escaping contact second place, owing to the difficulty of creaping contact with it, farm hands, and through them their families, will be especially exposed to personal infection and in some cases to air pollution also. In the third place, certain products of the farm, and especially vegetables such as produces of the arm, and operating regularities such as codery, radiates, turnips, beets and beet tops, spinach, water cress, lettuce, potatoes and onlons; and certain berries or other things grown upon or near the earth, such as strawberries and peanuts, which are either eat such as strawperries and peanits, which are extrer eater unwashed or "handled" preparatory to cooking; if they are irrigated with sewage or are grown on soils recently flooded with sewage, may become soiled with particles of excrement and infected with dangerous microbes or other

It must be confessed, however, that the exper of Berlin, the capital of the German empire the sewage of upward of two millions of people is disposed of upon sewage farms, seems to show that this danger is more theoretical than actual; for the death rate of Berlin from typhoid fever is one of the lowest among the great cities of the world, and the experience of Berlin in this respect is confirmed by that of many smaller cities in England and elsewhere. If it be asked why it is rlin, almost alone of all the greater cities world, has adopted sewage farming as its means of sewage disposal, the answer is that owing to its inland situation Berlin was compelled to devise some other means than see disposal, and having only a small stream in its anan see unposa, and naving only a small sream in its vicinity, was obliged to resort to some form of disposal upon land, i. s., either to intermittent filtration or to broad frigation (sewage farming). The former is lend disposal wholes reference to the giring of crops, the latter hand disposal combined with agriculture or horizoni-

The conclusion of the whole matter is that, except in the more and portions of the United States, the utiliza-tion of sewage in farming does not seem likely to increase

# Curiosities of Science and Invention

BADERS are invited to contribute to this department photographs of novel and ourious objects, unique occurrences, and ingentous contribunces. Such as are applicable will be paid for promptly.

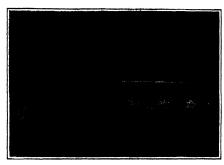
## The Licensed Sand Sculpter

TWHE sand sculptor, familiar to visitors I to the see shore, has advanced from a small beginning and a somewhat checkened career to the dignity of a regularly recognised artist. At first the efforts of this picture makes were crude in the extreme. Fashioned from real sand the figures he produced were searcely worthy of serious notice, either as art productions or as a bid for the coins of the beneficent. It was almost impossible to work with sand alone, and as the productions were as unsubstantial as the snow figures of the winter season, no one was interested in the "artists" work to the extent of more than a glance in passing on the board-walk at one of the seasifie resorts.

But in this country no one is satisfied But in this country no one is saturated for long with crudities. While sand artists abroad continued to work in sand alone, the American "sculptor" experimented with various materials until he had found something that would pass as " sand but which was almost as substantial as hardened clay. As soon as the improveents began to be evident and the public began to take serious notice of the sand artist and his work it became a profitable business and the sands along the board-walk began to swarm with "artists" Many were quite ignorant of art, but contrived to fashion a few figures that a good-natured public recognized as well intended, and rewarded with small coins. Some were genuine artists seeking in this way to pay for a summer vacation, way to pay for a summer vacation, or students trying to earn enough in the summer to weather the financial storms of the winter. These of course were annoyed by the ridicule brought on the annoyed by the runskilled ones and en-business by the unskilled ones and en-counters took place between rivals that at last compelled the authorities to take notice of the presence of the sand artist slony and take steps to regulate the business in some way.

Atlantic City was the first as ahore resort to insist on a license being first obtained before any one could stake out a claim on the sands and start business as a sand sculptor. There was application as a sand sculptor. There was application as a sand sculptor. There was application as the same of the sa

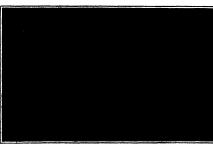
The figures are made of and and comean mixed, or give the finished work the hardness of mortar. One of the best and avists, the leader of the colony at Atlantic Chy, originated the exhibit of classed figures shown in one of the photographs. He was the first to construct his sand display-on a shanting base so that the exhibit fixed the board walk at an angle spitishile for observation and he also give, the fixed the total of white point which, throught these out in hold relief-active, the display of the colonial colonial



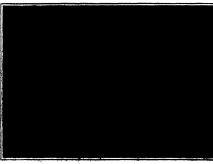
An 80,000 candle power searchlight for a transatiantic liner.



A clever bit of work done in sand and cement.



General view of the classic flours exhibit.



"Empty" ganalige berrel exploded by the sun's heat.

and even improved upon his idea. Suljects were selected that lent themselves to original coloring and with fine disregard for historical correctness the sculptors adorned George Washington, standing in the boat of sand in the set of crossing the Delaware, with a bright red coat and provided his sailors with blue shirts and his attendants with sartorial accessories of any hue that harmonized with the general color scheme.

# First Searchlight for Transatlantic Liners

THE most powerful searchlight ever carried on a merchant ship was a conspicuous feature of the "Kaserin Auguste Votoria," which arrived in New York researly. The great light, which is the largest type ever constructed, is designed for the steamship "Imperator." It is being carried across the Atlante to be thoroughly tested at see and on entering harbors. It throws a beam of light of 80,000 candle power. On approaching port, the searchlight was turned on the Sootland Lightship, rendering the name of the ship clearly visible at a distance of several miles. The great light is effective for seven miles at see, and when thrown upon the clouds is clearly visible for a distance of thirty miles.

The searchight reached the vessed only three hours before her saling and was exriced on the forward deek. It will be installed on the lookout, high up on the mainmast, where it can be swing quickly to any angle. The searchlight is of the type used heretofore only on the largest treadmought battleships. The leas is 42 inches in diameter. It is operated by a current of 13,000 watts on a 110-volt circuit. In actual tests at sea, the ray has perced fogs and distinguished distant objects at every point of the horizon.

# Precautions With Empty Gasoline Barrels

THAT gasoline is dangerous is pretty generally understood, though the death toll from careless handling is heavy. Usually familiarity with any dangerous thing breeds contempt, but even down in the "oil country" gasoline is treated with a respect that is greater than that given to nitroglycerine.

Many persons have always had the wrong idea regarding the dangers from gasoline. They have taken the greatest pressutions with the full barrels and have given soon steenton to the partially filled and empty ones, in fact, very few dealers and users have very given and the partially filled and empty ones, in fact, very few dealers and users have very given and the partially filled and empty ones, in fact, very few dealers and users have very given and the partial that the secompanying photo of an exploded "ampty" gasoline barrel. This barrel "went up" while standing in the hot sun on the platform of the freight station. It is a 50-gallon barrel made of heavy renn. The beads are of a single sheet, slightly corwined and set on a projection rulled on the inside of the cylindrical barrel sheet. A sold welded ring is placed against and around the head and the end of the sheet is rolled over the ring and tightly crimped. In the exploded barrel the bead was bulged like a groeer's scoop, the ring form apart and the crimp of the barrel sheet pulled out straight. This explosion made a very loud report and the pieces were blown to a great distance. Fortunately, no one was injured, though some damage was done to other equipment about the barrels is meant those that have been unloaded by dealers or garages, both public and private. They are the barrels rolled out to be returned to the refineries for refilling. These barrels are a source of danger and should receive greater care. The cause of the explosions of these barrels is the excessive pressure of the gasoline vapor generated when standing in the hot sun. A little off is label to be left in them and if the vent plugs are screwed in tightly there is danger of an explosion. Drain the barrels throughly and have the vents opened; also store the barrels

# Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

# Stagmatypy: A New Half-Tone Printing Process

F a solution of gelatine is cautiously If a solution of generic is among the two do not coalesce into a single homogeneous solution, but form an emulsion compoof manute drops of gum suspended in the solution of gelatine. If a glass plate is coated with this emulsion an irregular vibratory movement of the gum globules, of the character of the Brownian molecular motion, may be detected with the naked eye, while observation with a microscope shows that the minute globules gradually agglomerate into larger, though still very small spheres, which finally come to rest at approximately equal distances from one another. The configuration can be one another The configuration fixed by carefully drying the plate.

A plate of copper or zinc coated in this manner with a gum-gelatine emulsion which has been made sensitive to light by the addition of potassium bichromate. forms the starting point in a new and re-markable half-tone printing process which Dr. Hans Strecker has dovised, and named agmatypy, from the Greek word stagma.

In all methods of reproducing, by the printing press, photographs or other pictures having a continuous gradation of light and shade, the various tints, tech-nically called "half tones," are represented by lines or dots separated by white spaces. All of these lines or dots are necessarily of the same color—that of the ink used in printing -but they vary in width according to the depth of tint, so that every grada-tion of the original picture, from black to white, is represented by the proportion of black lines or dots to white space es in the places in the corresponding part of the reproduction, as in a highly elaborated pen-and-ink drawing. This principle applies to all varieties of printing plates, including relief plates in which the raised portions alone take ink from the roller, as in wood-out printing, etched plates in which the ink is wiped off general surface but not from the de-ions, and lithographic plates, which take the oily ink only at parts prepared for printing by previous applications of such

The disintegration of the half-tones into separate lines or dots is usually accomplished by photographing the original pic pushed by photographing the original pe-ture through a fine grating of parallel lines or network of intersecting lines, photo-graphed on glass. The result is a mechani-cal, lifeless print which often fails signally to reproduce the individuality of the original. The actual pattern of the grating, fortunately, is ant to escape the notice of the superficial observer, but it appear conspicuously under a magnifying lens and is often apparent to the naked eye. A person who has seen it in one picture is tempted to look for it and find it in others, and then his eye involuntarily follows the straight lines of dots, and the artistic effect is spoiled

es have been devised for making the "grain" of the picture less regular, but none of them have achieved complete and lasting success. In some of these processes the picture is photographed through a stippled or dotted screen, while in others no screen or grating is employed, but the "grain" of the half-tone print is produced by particles of asphalt applied produced by particles of asphalt applied to the metal printing plate in the form of dust, and then fused, before the senative film is applied. In the heliogravure process, for example, the polished copper plate is first dusted with asphalt in a special apparatus, and a second operation is required to melt the dust and attach it to the plate. A photographic copy of the pic-ture is made on paper coated with bichromsted gelatine and the undeveloped print is applied, face downward, to the asphalted copper plate. The paper is then washed togative and immediately estabed without off, and the gelatine film, which remains having undergone the separate operation of attached to the plate, is devoloped into a picture in relief by the action of hot water, righting, which the cordinary, half-tone, profit in the province of the province printing methods, is based on the tions employed in heliogravure, nariestly. property of bichromated gelatine to swell in hot water to a degree inversely prop thouse to its exposure to light. After all of these operations the plate is etched by immersion in a bath of ferric chloride.

the formation of the grain, the coating of the plate with the sensitized or exposed film, development and etching, are replaced

by two operations in stagmatypy. grain is formed automatically during the Even the ordinary half-tone process is coating of the plate, and development and technics and laborious in comparison with stohing are effected simultaneously by

This half-tone was printed from a Stagmatype plate

ployed are costly and fragile.

The new stagmatype process is remarkably simple. The granulation required to reproduce the half-tones is effected autonatically by the agglomeration and pre cipitation of the gum globules when the bichromated gum-gelatine emulsion is poured on the metal plate, forming a grain of approximately but not entirely regular pattern which, when dried, resists the action of the etching fluid very well. The

stagmatypy, and the glass gratings em- immersing the plate in a solution of ferric chloride, the water of which produces the development while the iron salt, diffusing through the film, etches the metal in exac ondence with the progress of development.

This remarkable simplicity makes stagmatypy much cheaper, as well as more expeditious, than heliogravure or the ordinary grating method, both of which it The only may replace with advantage ivable additional amplification would plate is then exposed under an ordinary be to make the original photograph directly

on the printing plate, and ever

on the printing place, and ever prove to be practicable. Another advantage of stagms the ordinary half-tone prec-greater richness of detail obtain print. It is obvious that a pi print. It is covious that a majo made through a grating or net reproduce every point of the origi continuous black line, for ema-necessarily represented by a broknecessarily represented by a broken time. In stagmatypy, on the centrary, the unattered negative is laid directly on the printing plate, the grain of which is farmed attendationally according to the sharniers of the picture, so that the reproduction of a black line is as continuous as the original. For the same reason, the stagmatype, seproduction shows a great superiority in contrast and depth of shadows—qualities in which the ordinary buffeters which the in which the ordinary half-tone print is

In order to obtain fairly satisfact results by the usual half-tone methods nonessary to use very finely ruled sor and the best grade of printing paper. and the best grade of printing paper, and to employ great care and skill in all of the operations. This is not commercially practicable for ordinary work, in which coarser screens are employed, with inferior results. In this respect, also, stagmatypy presents an advantage, for a coarseness of grain that would be intolerable in an ordinary process print is berely perceptible in a stagmatype print, where the grain is not gmatype print, where the grain is not aged in straight lines and set figures. On the other hand, the automatic at typo process can be made to furnish a much finer grain than can be obtained from ruled screens. Stagmatipp, therefore, may be applied to all grades of paper and subject, from the finest art reproductions to newspaper illustrations.

The new process is particularly advi

tageous in color printing, because it can-not produce the moiré effect which is often caused by inaccurate adjustment of the regular patterns of the several colors in the ordinary process. In stagmatypy the colors are automatically blended, and their proportions can be regulated in a novel manner by varying the size of grain for the different tinte.

The most important application of stagmatypy appears to be to lithography, both monochrome and polychrome. By printing the stone with a stagmatype plate etched in intaglio a wonderful softness of effects is produced, as only the fine in stices of the granulation are impressed the stone. Another interesting applica-tion is to the direct reproduction of drawings in pencil, charcoal, crayon or India ink without the intervention of the camera. The drawing, executed on a sheet of gelatine or similar transparent material, is laid on the sensitized stagmatype plate in and on the semanticed suspinatory present in a photographic printing frame, and the plate, after exposure, is simultaneously developed and stohod, in the manner described above. In lithographic copies made in this way the character of the medium. peneil, crayon, etc duced with wonderful fidelity.

For etching the stagmatype plates Dr Streeker has deviced an electrolytic methor which greatly facilitates the operation The plate, suspended in the ferric chloride The plate, suspended in the ferric chlore solution, forms the anode. An amperenter, included in the circuit, indicate the moment at which the action beg and the rapidity with which it progress Hence, the etcher is not compediat, we is in the useful chemical mathod, to the the progress of the action on the the progress of the action on the least with the greatest scare, it con-regition the strong staking bath by a one at the right monator. We seen force, conduct the scholars of a suppli-bate at the same time. The store of the same time. The store of this conduct the same time. The store of the same time. The store of this conduct the same time. The store of store of stort, as well as it is progress.



# de mark so a Husiness By W. E. Woodward-I

THE merage business man has only the suguest notion of the value of a trade-L'A impressi motioni of the value of a trade-mirit. He does not residise that it is very aften, the composition link between the pro-ciseor and the ultispale consensor; that it is a agribbal of good will, a temptible asset with a determinable money value; that it must be cleased and applied not in a haphacard way but with a due regard for its psychological effect upon the public. Nor does h realise the importance of complying with the statutory requirements which secure to the distillarly requirements which secure to him a property right in a trade-mark com-parable with the property right that an inventor negative by lating out a patent. The following is the first of a series of articles, written by a man who is all once a trade-mork, an advertising, and a busi-

se expert, a man who has a first hand sledge of the value of trade-marks and a correct methods of trade-mark explosio-The series, which will be eventually published in book form, will include dis merione, written in business English, the Federal trade-mark law, analysis of the requirements for registration, the elements d good trade ark, and trade-mark pro

s.-EDITOR.

If you should find in your Santa Claus stocking, next Christmas, a gift of the exclusive right to use the word "Royal" as a name for baking powder, you would be \$8,000,000 richer than you were the day before. It is said, on good authority. that the Royal Baking Powder Company lers its trade-mark worth just \$1,600. ounsacer is trace-mark worth just of coo-006 a letter. This is, perhaps, the most valuable trade-mark in existence, though it is rivaled in value by "Kodak," "Unseda," "Ivory" (as applied to soap). "Coce-Cole," the name "Gillette," in connection with safety razors, and a half-dozen others. Each of these trade-marks has become a national institution. To displace them in the public mind would require competition of unheard of magnitude and energy. The name "Coca-Cola" is worth at least \$5,000,000; the Gorham silverware mark, \$2,000,000, at a fair estimate; the trade-marks of the National Biscuit Company, all of which touch the highest standard of distinctivesees, must be the largest asset of that concern; and the name "Kodak"—where e Kastm an Company's business go to if it should hand over the trade- span of a generation, from a few hundred mark "Kodak" to some other concern, and go on making the same goods under the name of Smith's Hand Cameras?

The aggregate total value of well-known for their products by name, and they were American trade-marks must be in the at the mercy of the jebber, the whole-hundreds of millions of dollars. But any aler, and the retailer. They were supestimate of the value of a trade-mark, ported by a chain of discumstances, of apart from the business to which t applies, which overy link was weak. marily tomere guess, for a trade is inconsently exmerce guess, for a trude-mark is a species of commercial property that cannot be sold by freeff. It is fin-separably attached to the business from which it estimants, and cannot be trans-ferred without a transfer of the business. There are cases where a concern's trade-mark has become no valuable, through long passes of popularity and profit-making, that is entirely overshadows all other aspite, of the businesses his abort, the busi-ness, sunid, and surface without it. A trade-posite that the control of the control of the con-trol of the control of the control of the con-trol of the con-trol of the con-trol of the con-trol of the control of the con-trol o is a symbol of good-will—using Coffi is the eithe mase that the import mes is. It stands for built-up using: it is the link that connects allocate resource with the man-ner. It preserves the Hentity of Marking and in complete out this

estimable tue to the commercial world. Sometimes a complex chain of events

The second secon

is best explained by a simple illustration With this idea in mind, let us put ourselves in the place of a woman who wants a cake of Ivory soap. She lives in a desert town in Arizona. She cannot go half across the continent to Cincinnati to buy a five-cent cake of soap from the makers In fact, it is a safe bet that she never eard of the makers, but the knows that she wants Ivory soap. So she sends her little girl down to the "general" store, and this lisping mess enger asks for "Ivory oap-not just plain "soap"-and brings the familiar package with the name on it back to her mother. If the storekeeper some some other kind of soap the owner of the nickel knows instantly that she did not get what she wanted.

By means of the trade-mark "Ivory"

the manufacturers in Cincinnati deal with the manufacturers in Cincinnati deal with this buyer in Arizona as unely and as expeditionally as if she lived across the street from their factory. Trace this transaction backward, and you will find its trail running unerringly through the retailer, the wholesaler, and the jobber to the manufacturer—and at every stage of its immediate the street of the control of the conof its journey the product kept its personality. It left Cincinnati as Ivory soap, and as Ivory soap it was put into the consumer's hands.

Selling by trade-mark is one of the miracles of modern merchandising. Its development to a state of high efficiency has taken place during the last hundred

The early decades of the nineteenth entury witnessed the rise of three great forces which were destined to accomplish in a short time, the most profound changes in manufacturing and selling methods. These forces were:

1. The application of steam power manufacturing in a large and economical

2. The development of cheap and quick

ansportation.

3. The invention of means for the rapid

desemination of intelligence.
Factories employing thousands of hands great industrial monuments to cheap ower—had inevitably to find distant markets for their products. No longe er sit at home and await the buyer. His product was too large and its burden was too heavy to carry on a hap-hazard sales plan. sequently, the selling departments of all enterprises grew tremendously in im-portance. Customers were sought across the breadth of a continent. Many a manufacturer's sales area grew, in the square miles to a region that included every degree of climate from the arctic to the torrid. To accomplish this result When the American Tobacco Company of floring transportation were required. was recently dissolved into separate concars, under the order of the Supreme American Court, the trade-marks of the combinations trade-marks gree in importance tions were estimated to have a value of Manufacturers without trade-marks found that they had no hold on their trade.

which every link was weak.
On the other hand, manufactur trade-marks were firmly fixed in the public mind by reputation, began to see that they were, to a large degree, independent of the merchandising chain. The ultimate consumer knew their trade-marked products, and asked for them by name. Thus, by a process of natural avolution, the trade-mark developed in importance from a workman's tool mark to a symbol of good will--a business seset in a tangible form.

the first quarter of the ninete Before the first trade-mark legislation, ases of infringement fell under the com mon law, and were decided in courts of

equity.

H. D. Nims, a well-informed writer on trade-marks, says in his "Law of Trade marks and Unfair Trade"

marks and Unfair Trude."

It is rarely that one life sees the genesis and maturity of law, yet it has almost some them of trade-mark law. In the eletheenth contrary there were a few scattered decisions which turned almost wholly on the question of fraud. With the ries and proveth of machine-made merchandles of private marks of merchants to distinguish wases going out into the public markets of the world assumed importance and cases multiplied Trade-mark law is one of the results of machinery marks and unfairly contrary to the development of the last torty years.

A structure, of which the foundation

A structure, of which the foundation been so recently laid, must nece sarily be still unsettled. The rulings of both the Patent Office and the courts are, in many cases, contrary to precedent. In some instances, courts in different parts of the country have handed down con-tradictory decisions bearing on the same question. But, despite these drawbacks, a body of trade-mark law is being alowly formed, and it is only a question of time before our feet will be on firm ground.

Trade-mark cases should be entrusted to lawyers who have specialized in this branch of the law. The legal status of this subject is changing so swiftly that an ordinary lawyer, absorbed in general eep track of it.

A trade-mark has been defined as "any sign, mark, symbol, word or words which indicate the origin or ownership of an article as distinguished from its quality, and which others have not the equal right to employ for the same purpose. strictest sense, it is applicable only to a vendible article of merchandise to which it is affixed." (Ball v. Broadway Bazaar, Court of Appeals, N. Y., 87 N E. 674.)
We give this definition because it ex-

presses in the fewest possible number of words the function and limitations of trade-marks. Also, because there is in the minds of many business men, a confused notion of the difference between a trade-mark and a trade-name. By re-ferring to the definition it will be noted that a trade-mark is "applicable only to a vendible article of merchandise to which it is affixed"

On the other hand, a trade-name applies to a business as a whole, although this husiness may be engaged in the sale of not one vendible article only, but a thousand. For instance, "Wanamaker's" is a trade-name and "Kodak" is a trademark.

A trade-mark has no value except that created by the quality, sale, popularity and profit in the article to which it is affixed. No matter how distinctive or attractive a mark may be, it is worth but little if it is used in connection with an inferior article or with an article sold without profit.

But a distinctive and suggestive trade mark is of immense help in advertising and selling. Consider, for example, the trade-mark of Old Dutch Cleanser. It is full of human interest, notion, life, and suggestion. It brings up in the mind the mental picture of dirt fleeing from an energetic Dutch scouring woman. That this mark has been a powerful aid to sales is obvious. Suppose Old Dutch Cleanser had been called Climax Cleaning Powder? Can you imagine anybody getting together anything more than the most languid interest in anything with a name so dull? It reminds one of hard and sordid toil.

# Notes for Inventors

Wanted: A Domestic Dough Knood the A state of the control of the co

was large and clumsy and it was quite a job to hold the board and turn the roller in the stiff dough. Why does not some inventor devise a small compact dough worker adapted for domestic use, having use, having means for securing it rigidly to a suitable support and so geared as to render its hand operation easy for a woman or child?

To Protect the Aviator .-- Francois Rillean of Los Angeles, Cal., in patent No. 1,027,346, provided an inflated doublewalled body in the form of a frame having an opening or cavity to receive the aviator, a double-walled roof forming a head protector and the floor of the cavity forming a seat for the aviator.

Opening a Sash Lock from Outside .-- If you have ever forgotten your door key and found all windows locked, you will appreciate the importance of this sugg Some one should devise a sash lock which can be opened from outside by any person party to the secret. There might be some form of combination or some secretly dis-posed tripping device, by which the lock could be released whenever the nec If the improvement lock should be slightly more expensive than the comm cial lock, it would only be nec apply it to one sash, that on the window most convenient to enter, and it would often be found useful when the door key had been left in the house.

A Trough-shaped Aeroplane.—Joseph A. Williams of Cleveland, O., has patented, No. 1,027,954, an airship in which the plane is in the shape of an open-topped shaped trough which increases depth and width from its front toward its rear end, is open at its ends and has a suitably driven propeller at the rear wide end of the trough

Made Money by Invention. -- An attorney tells of a client who went to Washington a little over a year ago to secure a pat-ent. Recently when in Washington, he told of having made sixty-five thousand dollars the past year by the manufacture and sale of the invention. He produced an article that went into almost general use in a very active, prosperous industry and his problem became simply one of supplying a porsistent demand. To find an a industry and supply a revolutionary improvement is a royal road to fortune

Death of Major Janney .- Major Eli H. Janney, the well-known inventor automatic car coupler, recently died at his home in Alexandria, Va. The Major was a native of Loudon County, Va., and entering the Confederate army became a staff officer of Gen. Robert E. Lee. Shortly after the war, while engaged in business in Alexandria, he conceived the idea of the automatic coupler which for so long bore his name, "Janney coupler," and was a representative of the type which has come to be known as the M. C. B. or "Master Car Builders" coupler He soon demonstrated the practicable character of th invention by its actual use on a Virginia railroad, and the importance of his invention is acknowledged throughout the entire railroad world. Although more than eighty years old at the time of his death, he is said to have been engaged up to about two years ago, when stricken with his last illness, in experimenting with improvements upon original invention.

Safety Appliance for Airships.—Louis W. Stolp of Washington, D. C., has secured a patent, No. 1,029,475, for a safety appliance in which there is a movable element which holds the operator's seat in place upon the framework of the machine parachute is connected with the operator's seat and has automatic means to open its umbrella portion. Means are provided for releasing the operator's seat by hand from its connection with the framework machine and means are also provided which automatically release the opening means for the umbrella portion when the seat is By this construction, in ca accident, the operator can relea ... from the machine and will at the release the umbrella portion of chute, so it may operate to con; . his

# PATENT ATTORNEYS



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## PATENTS FOR SALE

RALE U. S. Patent No. 1.022,208, Im-Ratchet Wrench issued April 2, 1912. For information and all particulars address Wm. sos. Ros 65, Stamford, Conn.

MISCELLANEOUS MODEL AND FINE CLOCK TRAIN WORK Estimates given Work done by the hour or by contract Waitham Clock Company, Waitham, Massachusetts

# INQUIRY COLUMN

BRAD THIS COLUMN CAREFULLY—You will find magnitude for certain reasons of articles numbered in supprise for certain reasons of articles numbered in the control of the certain reasons of the certain reasons

Insuiry No. 9246. Wanted, addresses of owners and the second seco

Inquiry No. 9244. Wanted, address of manufac-urers making rifers, scrapers, and driers suitable for pasing sogn leaves. Inquiry No. 9246. Wanted, addresses of parties saving raw maretals or minerals containing potash in

Inquiry No. 9217.-Wanted, to buy a Parmelee

sermed ware? "PASA"—Wanted, to they a Paraelle and Pasalay, New 1993 — "Wanted the name and address as are used for printing a very identification of the pasalay and seed for printing a very identification of the pasalay and pasalay follows: 1 leastly New 29-33. "Wanted to they a pasalay relativistic basis. It must be obespean fully proved. It leastly New 29-10. Wanted addresses of partial leastly No. 9-207. Wanted addresses of from selling seven-obstand water turking.

Inquiry No. 925%. Wanted addresses of parties saving you materials to offer in our part of the world Inquiry No. 925%, Wanted to buy a machine for smooting the counting of a filter?

Inquiry No. 9260, -Want addresses of parties able to ship common garnet fint, emery or any material mitable as an abradve Inquiry No. 9281.-Wanted, a manufacturer to make user games

Inquiry No. 926: Wanted, to buy a glass which is a on ductor of electricity and the address of the makers of the same

makers of the same in the sources of the investment of the same investment of the same investment of the same interest of same

ences.
juquity No. 8488. Wanted, to buy machinery
or functions wire cloth to wooden frames with coppered

luguiry No. 8287. Wanted addresses of manu-facturers of motal specialties in connection with plate window glass.

Inculry No. 9273.—Wanted to buy a globe for a sarrior foundation, working on the Heron system.

Inculry No. 9274.—Wanted, the name of a manuscipuler of a machine to make oussion overs for fruit

ingmiry No. 9375. Wanted, name and address of

reasses ...
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In a

RECENTLY PATENTED INVENTIONS These columns are open to all patenties. The notices are inserted by special arrangement with the inventors. Terms on application to the divertising Department of the SCIENTIFIC AMERICAN.

## Pertaining to Apparel.

Pertaining to Appears.

IRLIT -T HERMITCHTE, 94 Union Ava,

IROM. No for trousers mounted upon the

welstiand thereof to maintain an approximaint; constant pressure on the person of the

wears while expanding to accommodate the

means for said belt to increase the

means for said belt to increase the

means for said belt to increase the

best of the belt, and members heing attached

to the trousers.

## Pertaining to Aviation

Persateling to Artation.
ARROPLANE-D. B. Davis, Franklin and
Willard Sts. Hollywood. Los Angeles, Cal.
This invention is applicable various types
of aerophane, but particularly application
of aerophane, but particularly application
are relative movement of the parts of the mean
supporting plane. Automatic means provide
to keep the main body in its proper position
whou cross or vertically-directed currents of
air are encountered.

# Electrical Bevices.

Risectrical Bevices.

TREAGINATING INSTRUMENT,—C. C. PRIMIONS, 841 St. Nicholas Ave, Manhattan, N. T. This invention produces an instrument attachable to a typewriting machine for use in conjunction there operated in harmony with the typewriting machine; produces an instrument which may be adapted as an attachment to typewriting machine; produces an anticomment to typewriting machines of usual construction; and provides an attachment wherein the continued in the instrument is discontinued.

## Of Interest to Farmers.

Of Interest to Parmers.
PIANTRE I. A ALLEN, Mason, Okla. Mr.
Allen's invention provides a planter which
will plant the swed at varying depths and
thereby secure a better stand. As with this
time of the planter of the planter of the planter
in surface, while other seed planted nearly
are planted as inch deep, the farmer using
this planter will be certain in all cases of
obtaining a good stand no matter what the
worther conditions may happer to be.

worther conditions may happen to be.

GANG AND MOTOR PLOW—E. B. Hall.

LAUG. 61h Franklin Ave. Mexico, Mo. The
object of the invention is to effect an improvement in means for attaching, suspending, and
adjusting plows with reference to a frame supported upon wheels which is supported on
wheels. When an obstruction is met, the plows
and frame rise until it is passed, when they
resume their proper position.

and traine free until it is gassed, went twy

CRAININ: PIN MOYDE DIVINE PLOWRY

—E. B. SELLAIR. 618 Frenklin Ave., Mexico.

Mo. In order to proude for driving a plow
at high or low speed and steering the plow by
power as well as by hand, Mr. Sellard connectal the motor last by hand, Mr. Sellard conprover as well as by hand, Mr. Sellard conmentary shaft, a double citude being employed
that will throw either a step-down or a stepup searing into action. The traction wheels
are driven by the supplemental shaft through
decengaged to release the wheel it controls,
and thus permit of steering the plow by motor

power

Of General Interest.

PORTAILE DERRICK—M. G. Bass, Walcott. N D. This derrick is capable of being carried around by hand or on wagons and handled preferably by one person. It comprises a pair of posts swived relatively to each other and adapted to be folded to different purposes and embodies a number of structural improvements whereby its efficiency are greatly increased.

CERLY ACCUMENTING APPLIANCE—A

are greatly increased.
CRRID'S ACCOUNTING APPLIANCE—A.
L LAMBERT, Concordia, Kan. The instention in this case is to propride an appliance more especially designed for the use of serechants, to keep the accounts of customers who hop nor, to allow a saleman to readily ascertain the customers secount and the permit under allowing account the customers account to the customers account.

account. MOA.-W S Anizs, care of Empire Plow Co. Cleveland Obio. One purpose of this invention is to provide a box having a plurality of shelves movable relative to one another so as to expose simultaneously the contents of all the shelves, which can be folded up in a convoluted air light manner, so that the contents will be protected from dust and dirt and keep perfectly freal

kept perfectly fresh Wrmigreinsins, Route No & Mollo—II Wrmigreinsins Route No & Linton ind The object here is to provide a mould more capecially designed for making concrete fearer posts and like articles, and arranged to allow convenient and secure removal of the post after being moided to permit immediate re united of the moid for forming another post while the draft one is setting.

a scient of from \$1.00 a, \$2.00 a.

A machine for place of the first one is setting. Individual part of the fir

ated therewith for helding a load, means gravitationally operating the beam to raise load, and automatic means controlled by load-helding means for leighing the I against movement in one direction. Be-4 by the

ACCIOCE SAMBLEMENT DE COMPANION DE COMPANION



being useful in warehouses, it can advantageously be used in lifting and transferring weights from point to point. The engraving shows a side elevation of an embodiment of the investion, having parts in cross section. DRYING TABLE—P. I. Benoutes, care of Acne. Cluth Nirnking Machinery Co., II. 4th Rt., New York. The cloth in the piece is passed over the table to dry before shricking it, the table being arranged to insure uniform drying of the fault with the greatest econying the fault with the greatest economy of the control of the control

# Heating and Lighting.

Heating and Lighting.

INCANDENING EIRMENT—D. J. MonoMININ, Beperer, Ohio This inventor has produced an incandersing element made up of
lamine or plates, each plate being weakened
by ald of score lines on as to cause the plate
to break along said lines if it breaks at ali,
thereby preventing fracture of the element
along any line or plane except one parallel
with add score lines or with plates.

# Household Utilities.

Household Utilisies.

TEA BREWING APPARATUS—C. A. SRIENAN, S81 4th Are, Manhattan, N. Y. This invention provides an ura composed of two independent units, in the upper one of which the tea or other infusion may be brewed and directly withdrawn from the same; or the intused liquid may be withdrawn from its contact with the tea or other substance from the lower unit or receptacle.

Machines and Mechanical Devices,
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918 Madions St. Brooklyn, N. This invetion relates to match making machines having an endies chain of carrier plates for securing the splints and carrying the same from device to device for automatically com-pleting the mafches and finally ejecting the same

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—O. J. Gean, 'Callahan, Cal. This improvement provides a firthing near for automobiler and provides and the provides and the provides are provided to the provided provided to the provided provided to the provided provided to the provided provi

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Norm.—Copies of any of these patents will be furnished by the Scignwift American for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

The palest the plant of the invasion, and we will be plant.

We wish to call attention to the fact that we are in a position to render composition errors in reversion in every composed of mechanical, electrical and chemical experts, thoroughly triained to prepare and procedure all patent applies thou, irrespective of the complex nature of the mitgets make involved. Encovering required the render complex nature of the mitgets make in most complex nature or the mitgets make in make in part of the mitget of the mitgets of the mi

roedway. Into York, N. Y. tranch Office: 25 F Street, N. W., Wattington, D. G.

EMULTARENTO FOR TAKES SPACELAGE.

Massual for the Medianushion of LatLatimed by Waster. By Charles (Latimed by Waster. By Charles (Latimed by Waster. By Charles (Latimed by Masser), 1912.

12mo.; 350 pp.; illustrate Price, 25.

Price, \$2.

The United States' table before them question changes problems and goodstidtest them; large changes problems and goodstidtest them; large other country of the words. Stone she drainaged on the truet now known as Central Park, in 1868, progress in land reclamation but been needy. The word issues increasing onlike for the drainage stations and exclusion will find in this conders seen and students will find in this conders seen and the contract of the drainage stations and construction of open distribute, survey, undertrains. Sow in open channels, the location and construction of open distribute, large systems, the redunation of tidal lands, the drainage of firigated, peat, and muck lands, and the phases of the subject are set forth, with tastest phases of the subject are set forth, with tastest makes and keeping adoquate accounts and pro-ords.

mates and keeping adequate accounts and records.

DRIDGE AND DREDGINO. By Charles FreItal. New York: D. Van Nostrand
Company, 1911. 870; 279 pp. 82

The first power during or which we have any
knowledge was designed by one Cornelius Meyer
in 1683. It utilized thorees in the construction or
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the material of the second of the construction or
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plainly the districtive features of the various
types and the relation of these features to the
work performed. Mr. Freinfi has given us a book
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that is instructive and fascinating in a very high degree.

COMMINTARY ON THE SCIENCE OF ORGANILATION AND BUNNESS DEVELOPMENT.

By Robert J. FYRID, LL.R. Chinggo:

Commintary of the Comminta

WARSHIPS AND THEIR STORY. By R. A. Fletcher. London, New York, Toronto, and Melbourne: Cassell & Co., Ltd., 1911.

and Melbourne: Cassell & Co., Ltd.,
1911.
In writing this work the author discians any
inention of treating of the structural problems
relating to warships or intricate matters of
strategy and testing, at the strain bean to a
tendent of the strain of the strain bean to a
tendent types of warships favored at different
times in different parts of the world. He shows
how type has succeeded type, and he describes the
main lines of divergence and development. The
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the kind of information he wants, and gives it in an
interesting way. The surpher has done his seldwest The half-tone work of the book is particularly
readdefined.

A SHURT COURSE IN GRAPHIC STATICS. For Students of Mechanical Engineering. By William Ledyard Catheart and J. Irvin Chaffee, A.M. New York: 2. Van Notsmand Company, 1911. 12ma., 185 pp., 45 Situstinidens. Prince State State Course of Company, 1915. 12ma.

# In the 10-Year Race for Favor Here's the Tire That Won

In the first ten years of this 20th century came a race for supremacy in pneumatic tires.

All the leading makers were in it.

And all of us knew that the tire which won must excel all others in the test of use.

In the past three years came the verdict, in vivid,

In 1909 No-Rim-Cut tires began to be preferred. In 1910 the sale doubled. In 1911 it doubled again. So far this year it has trebled over last.

Now the most popular tire that the world ever knew is the Goodyear No-Rim-Cut tire.

And now an output of nearly 100,000 tires monthly fails to keep pace with the call.

# ${f Voices}$ the ${f Verdict}$ of ${f Over}$ 200,000

Over a million and a quarter of these premier tires have now gone into use.

They have been tested out on some 200,000 cars.

So the status today of No-Rim-Cut tires voices the verdict of 200,000 who have tried them out.

A verdict like that is too overwhelming for any tire user to question.

# Six Times Larger Than in 1909

In the year 1909—our tenth year of tire making—we sold 105,-127 Goodyear tires.

In the past twelve months our output has been 649,147 pneumatic automobile tires.

So the demand for these tires, since 1909, has more than multiplied six times over. It doubles now every few months.

These figures tell, in a vivid way, how users regard No-Rim-Cut tires.

# How Goodyear Won

We brought to our factory years ago the best rubber experts we knew. And every year we've added to the corps.

To compare their ideas we built a tire testing machine. There four tires at a time are constantly worn out under all sorts of road fondi-

Every new idea in formula or febriz, material or method, was put to the milesge test. And those which won were adopted. Thus we compared 240 formulas and fabrics. Thus we compared every factory method. Thus we compared rival tires with our own.

As the years went by, in this ceaseless selection. Goodyear tires became better and better. At the end of ten years we had come close to finality in wear-resisting tires.

# Rim-Cutting Ended

During this time we brought out our patent type of tire. This type—the No-Rim-Cut type—makes rim-cutting forever impossible.

Statistics show that 23 per cent of all runed old-type tires are rimcut. And rim-cut ruin cannot be repaired.

This new-type tire saves that 23 per cent.

We control by patents the only way to make a practical tire of this type. So the multiplying demand for tires that can't rim-cut has centered on Goodyear No-Rim-Cut tires.

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Then we made these tires 10 per cent over the rated size. That meant 10 per cent more air—10 per cent greater carrying capacity. It saved the blow-outs due to overloading.

This 10 per cent oversize, under average conditions, adds 25 per cent to the tire mileage.

By these two features—No-Rim-Cut and oversize—we cut the average tire bills in two.

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These new-type tires, made oversize, cost more to build than oldtype tires of just rated size. And Goodyear is the costliest quality that goes into tires.

Yet Goodyear prices have kept close to other standard tires.

As a result, our profit last year averaged 8½ per cent.

By giving most we have gotten most. Those are the only reasons why No-Rim-Cut tires now dominate in Tiredom.

And those are the reasons why you will employ them when you once find them out

Our 1912 Tire Book—based on 13 years of tire making—is filled with facts you should know. Ask us to mail it to you.



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opposite saces.

Through the base of this tire run six flat bands of 128 braided wires. These make the tire base unstretchable, so nothing can force it off the rim. But unlook a flange and the tire slips off like any quick-datachable.



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# The Efficiency of the Large Manufacturing Plant By Sidney Graves Koon, M.M.E.

A comparison of these figures will show A comparison of taxes nightes was about 50 per cent more output.per man than the average of all plants, and 80 per cent more

average of an indicate and so per cast more than did the 40,000 smaller plants. In value added through manufacture, the large plants showed 23 per cent more per

large plants showed 23 per cent more per man than the total average, and 32 per cent more than the smaller plants. This estab-lishes our second point, the increased economy of operation of the large plant.

And it is due in large measure to better facilities for handling materials, cranes and

other labor-saving machinery, improved

other labor-saving maciniery, improved railroad connections and service, and less of the "jack-of-all-trades" in the make-up of the "hands." To what extent the new fad "seemitife management" has influenced this result is problematical.

The general gain in efficiency all along the line is shown by the figures for all the five groupings given in the census bulletin, plants with less than \$5,000 output; be-

plants with test than \$20,000; between \$20,000 and \$20,000; between \$100,000 and \$1,000,000; and over \$1,000,000 annually. The gain in the establishments as a whole was from \$2,904 product per "hand" in

1904 to \$3,356 in 1909, an increase of 15.6 per cent. In value added during the pro-

cesses, the gain per hand was from \$1,330 to \$1,507, or 13.3 per cent.

All of these points are best shown in the subjoined table. In the table, all figures for total values of products and total values

added, represent millions of dollars. The total products amounted to \$3,369,490,192

total products amounted to \$3,369,490,192 in 1909 against \$2,488,435.79 in 1904, a gain of 35.4 per cent. The total value added in manufacturing increased from \$1,139,742.293 in 1904 to \$1,512,858,850 in 1909, or 32.7 per cent. The value added represented 4.55 per cent of the product in 1904; 44.9 per cent in 1909.

R EADING between the lines of the cen-Rus bulletin detailing manufactures in New York State, one of the first State reports issued, and covering 16.3 per cent of the total manufactures of the United States, a number of interesting facts are disclosed. It is found, as was to have been expected, that the proportionate output of large establishments is increasing, while that small plants is decreasing. It also appe while that of that the efficiency of production in the large plant is much higher than in the small one, more product per man is turned out, and (what is of greater real importance) a and (what is of greater real importance) a larger value per man is added to the product as a result of the manufacturing processes.

And this "efficiency" has itself shown a
marked increase during the five years between 1904 and 1909, covered by the cen-

The first item mentioned is due to the oncentration of effort and capital, in small plants and small industries as well as large ones, to combinations of men and enter-prises, to the rapidly developing idea in prises, to the rapidly developing idea in manufacturing which has been so aptly expressed in the State motto of Kentucky: "United we stand; divided we fall!" Cooperation is the keynote, and it is finding expression in establishments of all sizes So it follows that the ratio of the output of the large plants to the total output is in-

Plants with an individual annual pro uct of \$1,000,000 or more numbered 294 in 1904 and 470 in 1909. They employed 20 9 per cent of the total number of wage earners in 1904 and 25.4 per cent in 1909. They furnished 32.8 percent of the products in 1904 and 37 per cent in 1909. They added value through manufac-turing processes amounting to 25.9 per of the total in 1904 and 31 per cent

Annual Product per Plant	Date	Wage Earners	Millions	of Dollars	Dollars per "Hand "		
			Product	Value Added.	Product.	Value Added	
Over \$1,000,000 \$100,000 to \$1,000,000 Under \$100,000	1900 1904 1909 1904 1909 1904	255,383 179,488 438,229 393,872 310,369 283,587	1,246 816 1,413 1,103 711 570	469 295 664 531 380 313	4,879 4,547 3,924 2,799 2,290 2,009	1,835 1,646 1,516 1,349 1,223 1,104	
		To	otals—All Pla	nt#			
	1900	1,003,981	3,369	1,513	8,356	1 507	

ciates, by which one of the greatest been turned into a veritable health resort, is now known and appreciated throughout civilization. It is gratifying to realize that tropical regions. For example, the Gold Coast and other

West African colonies have long beer branded as graveyards of white colonists From 1881 to 1897 the white Gold Coa mortality averaged 75.8 in the thousand for each year, in Lagos it was 53.6. Since 1897, however, mosquitoes and rats have been fought on lines laid down by the scientific bacteriologist; water supplic been purified and protected; and anti-typhoid morelations have been made. typhoid moculations have been made. The result? In the years 1903-1906 the death rate was 24.3; during 1907-1911 it was 17.6; m 1911 it was 13.7. Here is a record fairly emulative of Panama.

India, the home and the source since the dawn of history of many a "world pestileave. I has now a standing British army of about 72,000 men, among whom malarial fevers are the most common illness; for-merly typhoid was by far the most deadly. Comparatively little progress has been made against the malarias but the enteric diseases have been so well combatted by

Conquering Infection THE epic work of Gorgas and his asso-lized by the white residents and soldiers. nearly twice as numerous as the British nearly twice as numerous as the British similar progress has been made. While in the whole native population of "fatalis-tic" India (which has from time immemorial, up to a few years past, looked upor cholera and the plague as "visitations were impious to defy) the death rate in 1910 was 33.20 in the thousand, as against

35.40 in the preceding five years; the birth rate rising pari passu from 37.51 to 39.52 Such achievements as these are in truth but part of a world-wide and constantly more and more victorious fight with dis-ease, and especially with epidemics against which mankind has ever, up to our generation, been almost defenseless. Thus, by reason of the necessities of tropical coloni-zation, are infectious diseases being eliminated from those regions; though of cours medical science cannot remedy the hig temperatures, which induce in the Cauca ian the "tropical wrath," characterized it so sadly is by intemperance, lassitu periods of spasmodic mania and of hide ously cruel acts toward inoffending and defenceless natives.

When such triumph over disease can a schieved despite the formidably adver conditions obtaining in the tropics there should be an even greater mes unexases nave heen so well combatted by should be an even greater measure of smineans of sanitation and incomitations that come might almost be sanguine of their settinetion. Five years ago the death rate and to preserve foods and waters pure, was 2.66 in the thousand, a marked reduction from former years; in 1910 it was reduced to 1.85; in 1911 it was but 0.63. In seasier to effect and civilization more Nor was all such improvement monopositions.



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# Bacterial Purification of Water and Sewage (Concluded from page 57.)

rtheless, the rural community and the large private estates in the country have similar problems which have to be faced and solved. In the latter case, especially where convenience has demanded an up-to-date water system, there is the greatest need of a careful scientific study to the end that the final disposal of the wastes shall be safe and complete. As a rule too little attention has been given to this phase of the subject by those most interested. It is generally thought sufficient to get the sewage out of sight under the ground somewhere and as long as no obvious nuisance arises, no further thought is given to it. The fact must be borne in mind that the purifying agency of the minimize the purpose agency of minimize soil lies quite close to the surface. At moderate depths, these being greater with the more open soils, the air supply is insufficient for the proper action of the bacterial life and the continuous discharge of sewage under ground in such a way that it tends to sink into still lower depth is a mere evasion of the real problem. This is a mere evasion of the real problem. This sewage mingles with the ground water and will reappear at some point, possibly remote, possibly in the well or spring of the same place, or of a neighbor, but in all cases practically unchanged in characteristics ter. Examples are not lacking in which disease-producing bacteria have been con-veyed many hundreds of feet through compact soil. Several typhoid fever epiemics resulting from such a situation have been recorded. The water and sewage problems of country homes depend upon so many local factors that any general discussion of them would be quite futile. This is a matter, however, which futile. This is a matter, however, which justifies most careful study in each par-ticular case, and the science of sewage disposal has now advanced to such a point that satisfactory and economical solutions are always possible

# Insects and Disease

(Canoluded from page 84.) the non-immune population. Since this mosquito breeds by preference in fresh, clean, quiet water, the first thing to do in ng this species is to render collec tions of water inaccessible to the mosquito. These are usually found to be water-con-tainers of various sizes, such as barrels tunks custerns, tin cans, sags in roof-guttanks, eisterns, in cans, sags in ron-gui-ters and the junction of the leaves with the stem on plants of the Agara family, Breeding places may be sercened, drained, salted, oiled, stocked with fish or destroyed.

It is also necessary that measures be taken to prevent the mosquito from befever occurring in the yellow fever belt should be screened for the first three days of illness, and upon the recovery or death of the patient the house should be fumi-gated to kill mosquitoes. For this purpose, sulphur dioxide, which may be produced by suphur atoxide, which may be produced by burning sulphur in the proportion of two pounds to the thousand cubic feet of initial air space, is perhaps the best agent. Mosquitoes may also be killed by burning pyrethrum or tobasoo, but these latter methods are less efficacious. It should be been in mind that formaldeaded white it. borne in mind that formaldehyde which is used as a fumigating agent for certain diseases will not kill insects. It is interesting in this connection to note that in those locations in the tropics where yellow fever is endemic the disease is probably kept alive by infants in arms who have it in mild form and thus continue the cycle between the mosquito and the human

The yellow fever mosquito is ea entially The yellow rever mosquito is cosciusary a domestic animal and as far as its relation to the disease is concerned need be considered only in connection with its proximity to the home of man. The malaria imity to the home of man. The manara mosquito on the contrary does not neces-sarily live in close proximity to man and will breed in almost any deposit of fresh water which is quiet and not stocked with water which is quiet and not stocked with fish or insects which destroy the mosquito-larys. The same general methods of ex-termination as outlined above may be used, but they should be carried on in a



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wider radius and should include the drainage of swamps. In addition, the histings over low the disease may be partially occurredled by the dolly administration of small does of quinties to sell persons Britage in infected zone. Also, in the control of the sell persons the sell person districts of the partial person districts of the control of the sell person districts of the control of the sell person districts of the control of the zero and person districts of the zero and person districts of the zero and person districts of the zero districts of zero districts of zero districts of the zero districts of the zero districts of the zero districts of ze

to health and commerce.

Reference has already been made to the role of the flea in the transmission of plague. This is of extreme importance because plague is primarily a disease of rodent and secondarily and accidentally a diseas of man. Almost every fur-bearing anims has fleas which may be easily infected by the ingestion of infected blood. Thus, it is found that the rat flee, the ground squirrel flee, and the tarbagan flee have all been convicted at one time or another of having convicted at one time or anower or naving transmitted bubonic plague. The remedy is obvious. If the animal carrying the fles which bridges the space between the in-fected rodent and the well human being be excluded from the home of man there need be little fear of bubonic plague. Therefore the work which was carried on in Califor nia for the eradication of plague was di rected very largely at the extermination of This may be accomplished by a simultaneous attack upon the home and the food supply of the rat and by killing them by the use of poisons and traps. them by the use or possons and traps.
Plague is out upon its march around the
world, and for the past five years has been
making a steady advance up the Spanish
main Very recently it has appeared in
Porto Rico and for all we know it may now be smouldering in the rodent populatio be smouldering in the rodent population or some of our large Atlantic scaports. If a survey of these rodents is made now and the foci of infection stamped out much money and many lives may be saved in the future. This is a measure of immediate necessity if we would protect our sanitary

and commercial interests.

Not the least interesting aspect of the transmission of disease by insects is the role played by the tick in this regard. One species of this insect is known to carry Afrecan tick fever and we have a strictly American disease almost wholly confined to the Western islates, Bookly Mountain tick fever, which is carried by another appeals, the Dermacentor endersons. The organism of his disease has not yet because the companion of this disease has not yet because the companion of the disease and the product of practical control of the control of th





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bernt off. This work has been in operation for only a single summer, but it has assulted in the total constion of cases in what was bitherto a badly infected

The companies of the co

freed from this disgusting pareasite. It is not at all improbable that bedbugs also carry disease. While this has not been proven definitely there are numerous instances on record in which the evidence tends to incriminate this aposies. The remedy is apparent.

# The Destruction of the "Schwaben"

The old wooden sirabip shed at Duesbedorf is fast gaining a reputation as the aerial "hooded odes." When everything about the Zeppelin ships appeared source as less, after four of them had been making record trips, the "Schwaben" (fortunately laured at her full value against fire) was destroyed as if by a bolt from a clear sky, after her 21th passenger trip, in close proximity to the same Duesseldorf shed that twice weeked the "Deutschland." Bhe was at anchor, weathering a storm for hours, and trying to avoid a risky entrance into the shed, when a severe gust raised her into the air, broke her book and ignited the excepting gas, presumably by friedsheal electrical gas.

The disaster must be ascerbed to the over-confidence impired by handling the ship safely in so many storay handling, which, as a vistors well know, may all of a sudden show quite unfamiliar antion and effects. Again the lesson was emphasized that men, even in great numbers, can-hor repiace reliable anchors. The four concrete blocks sunk into the ground, around which the chip swings like a weather vane, held by a swivel at the ends of four converging cables, were not in use, because these are placed farther from the shed to give room for the ship's may nowments.

The control of the co



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have happened; for the shrible offit instread; break aring, as otherwise the mag holding it would not the beautiful the beautifu for free flight.

If there had been no sansahing there would have been no eccuping gas and no electric sparks to ignite it. But a water sprinkting civing (tried on the "Sunkard") inside the hull and above the ballonest could easily guard against irrictional electricity in critical eleuations, and German manufacturer are how hard at work upon a halloon cloth that cannot be electrified friction or concussion even in dry air

# The Current Supplement

N this week's SUPPLEMENT, No. 1906, Arthur J. Hoskin discusses very lucidly the legal and technical points which require consideration in connection with the opening of new mines.—C. M. Chap-man writes on Methods for Testing Coatman writes on Methods for Testing Cost-ings for Cement Surfacea.—A richly illus-trated article by L. Claremont tells our readers of the wonderful gem industry carried on by the natives in Ceylon.— The benefits to mankind which have been gained by experiments upon animals can not be brought with too great emphasis before the public. Much has been written on the subject, but the article which apposers in our current issue is one of unusual merit and porsuasive force and should be read by all, especially by those who perhaps may set be very fully informed on the subject and may possibly still entertain some doubt regarding the great gains which medical science has to record in this quarter. Day Allen Willey contributes an illustrated article on the remarkable engineering feat accomplished in the building of a railway in fee-bound Alaska.—A report of some tests of a simple engine taking steam at less than atmospheric pressure is of particulars. pears in our current issue is one of unusual atmospheric pressure is of particular interest in connection with the utilization necess in connection with the Hillization of solar energy.—Dr. Zahm, the noted American authority, contributes a masterly article on Elements of Theoretical Acromechanics, which will run as a serial through two or three issues.

# Centennial of Gas

WHEN and where gas was first used, it seems to be difficult to ascertain. Yet 1912 is regarded as the one hundredth not 1912 is regarded as the one hundredth anniversary of the introduction of illu-minating gas. Apparently the event to be celebrated is the origanization in 1812 of the London Glas Light and Coke Company. Gas, however, was used for illuminating purposes long before. Merchot used it for lighting as early as 1795 and perhaps purposes long before. Meurdoch used it for lighting as early as 1795 and perhaps earlier. At all events, in 1798, he put up a gas plant for Boulton, Wett and Company, in Soho. The American city of Baldimore is credited with being the first to apply illuminating gas practically to general illumination. There was a small plant in Newport, Rhode Island, as early as 1813, which antedates the Baltimore plant by eight verse. eight years.

# Tunnels in Constantis

IT is reported that the Turkish council of state is studying a plan for an undeground railway to counset distributed with or easte is studying a plate for a ground railway to consider étainel. Pers, under the Golden Teirismultitus plan, which English assubitus plan, which English as déuble influe under the Hesporaus. It has carrenne pointe et Besporaus. The comment of Biography and The Comment of the Religious and Asiania Theorem and Asiania Theorem.



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# The way out of the political fog

You, of course, want to know the trend of things political this summer, but unless you are mighty unusual you will find it hard to get any clear idea from the newspapersthe facts are there but it takes a lot of wading to find them. The things you will want to know are in

# WORL WORK

and you will find them easily and in such form that you will take pleasure in their discovery.

The WORLD's Work provides a pleasant way of finding out about the things you are most interested in. But in a political ferment like the present one it is a positive life-asser. Think of the confusion of the next four months and you will realize that we are offering you a swing help in time of trouble' by suggesting that you stip a dollar with the coupin attached like on a newedope and send it to its at one.



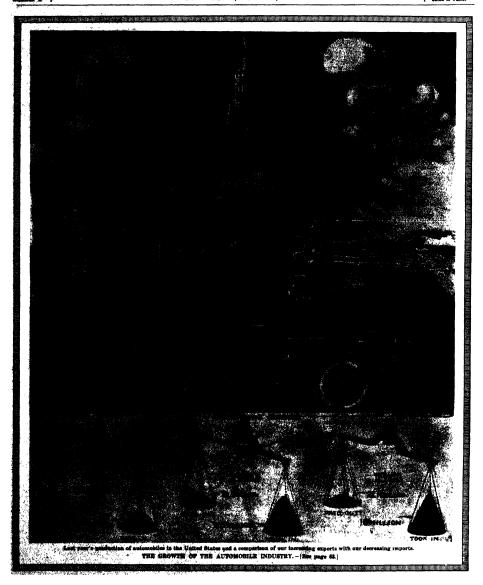


# THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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NEW YORK, JULY 20, 1912

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# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, JULY 20, 1912

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The purpose of this journal is to record accusately, simply, and interestingly, the world's progress in scientific knowledge and industrial scherement.

# Human Fallibility and the Automatic Stop

HE theory of the automatic block signal system as applied to railroads for the prevention of collisions is perfect. In practice as carried out of by day on the railroads of the country, proves that it is not the absolute preventive of collision which we boped it would prove to be. From time to time there have occurred serious railroad dissaters which an effective working of the block signal system should have rendered impossible. The latest and nost frightful of those were the rear end collision, at Corning, New York, and Latrobe, Pennyivania, when nearly one bundred people lost their lives, and an even larger number were injured.

It is not sufficient to say that these accidents were due to the human element, which can never be confrolled by any mechanism, however ingenious and effective it may be. A block signal system, if it is to do its work, must make it impossible for two trains to be in the same block at the same time. This, the present system cannot do in those cases where there is negligaces on the part of the operating skaft.

In the Corning disaster, the engineer ran by two block signals, and appears to have taken no notice of a third signal, placed in the rear of the stalled train by the brakeman. In this case, the collision was due either to the carelessness, with disobedience, or mental and physical incapacity of the engineer. Just how he came to run by these signals will be shown during the official investigation.

The point we wish once more to emphasize is that the block signal system, as at present laid out and operated, is not absolutely effective. It lacks one element, simple and readily installed, which, if it were present, would render block signalling absolutely effective as a preventive of collision. We refer to the auto-

The automatic stop is as essential to a properly constructed block signal system as the trigger is to the gun. This gruesome Corning disaster simply emphasizes a fact which this fournal has many times prochained in the past few years, namely, that the excellent false embodied in block signalling can be made absolutely effective only by roudering it mechanically

Impossible for a train to run by a signal.

It is "up to" the railroads to install the stop on all important lines carrying mixed traffic. At present they do not look favorably upon this mechanism. They dislike the first cost and they have an equal dislike for the cost of maintenance.

We comment to the consideration of the Interstate

We commend to the consideration of the Interstate. Commerce Commission—that fine body of men which is doing such magnificent work, both for the rathroads and its patrons—the necessity for the installation of the automatic stop on all important lines carrying a heavy and mixed traffic of express and passenger trains a phore arm is up, the trip will be up. Moreover, the trip should operate to close the throttle and apply the brikes simultaneously. Also there should be some selftive, when it has been tripled carries back to the round home a visible record of the fact that the engineer has run by a signar.

Railroad managers complain bitterly of the lax ideas of dhelpline which prevail among the operatives of American railroads, and name this as a fruitful cause of accidents. The best corrective is to place the careless operator, where automatic control.

# The Fate of Vaniman

LTHOUGH there was no survivor to the dreafful catastrophe that blotted out what has been the most determined attempt so far to supply America with at least one dirighble of businessilke proportions, it is by no means so difficult to point out defects in the "akron," which rendered it liable to such an accident.

Building a dirigible balloon of large size is a problem that bristies with engineering difficulties, especially if the balloon is to be non-rigid, as was the "Akron." It calls for a man who is not only a clever mechanician and inventor, but an architect and civil engineer of

The large European non-rigid dirigibles have been devolped step by step. The first diross, Parseval, and Leobaudy airbalips were every small; the first "Ville de Parls," a mere enlargement of the Santos Dumonts, was a complete failure.

was a complete failure. Vaniman began with the size of almost the largest Vaniman began with the size of almost the largest European non-rigid dirigibles. It did not follow any European model. The shape of the envelope did not show any "speed lines" (auch as those developed in the laboratories of Europe); there were no adequate steadying flus; the rudders were too small; and while the 280 horse-power propelling plant was rather weak for the displacement so that the speed could only be quite moderate, there were no seroplanes to counteract the changes in the gas lift, as in the large French dirigibles with moderate power.

We must remember, however, that the "Akron" was not built to sail over land, which explaint the departure from European design. It was intended particularly for a transatiantiv centure, and as economy of fuel was a vital factor, Mr. Vaniman intended to drift as much as possible. To attempt to drive the sirabily across the ocean at a speed of forty to fifty miles an bour, such as attained by European diriabiles, would have required more fuel than he could very well have carried. Mr. Vaniman was, therefore, trying to build a new type of atraibily which we may call a "drifting dirigitile," contradictory as the term may seem. Such being the case it was not necessary for him to use more than one or possibly two engines at at time, as he desired to make little more than at time, as he desired to make little more than steerage way, with a weak power plant and a machine that was to be blown by the winds, the "acroplane lift" idea was discarded I nated, Mr. Vaniman depended upon driving his airship down by means of orientable propellers and also by pumping at buildst in the buildness until be could come near enough to the surface of the sea to pick up was the builds to his "hydrolevator."

It is probable that Vaniman, when he found the hot July sun squeezing all the air out of the air ballor against the heavy weight on their safety valves, and trying to expand the gas still further, depended on preventing further ascension by keeping the gas forcibly in the envelope under compression. Just why he did drive the machine down with his orientable propellers who can say? He had two sets of them, one pair driven by an 80 horse-power engine and another by an engine of 800 horse-power. It was the first ascension of the "Akjon" on a hot summer day. Accounts clearly establish the fact that the airship, when the sun gained its full power, began to rise steadily until everybody wondered about the unprecedented and uncalled for altitude. It ascended until all the air was forced out the ballonets; then it burst. It is now evident that the first reports were erroneous. The gas was not set on fire. The uncharred envelope is conclusive evidence of the fact that fire played no part in the catastrophe. The whole occurrence is a close parallel to the fate f Oskar Erbsloch's dirigible in 1910, that burst in the air, when it suddenly emerged from a dease fog into sunshine, killing all aboard Only in Vaniman's case it came more gradually; in place of a German fog there was the characteristic American summer haze which greatly influences radiation. The higher the "Akron" ended the more the baze thinned, and the more po erful became the sun. At this moment Vaniman ought to have pulled the valve cord energetically, but it is whether he resliked how much discretion is required in piloting large, non-rigid airships. It is subtful whether Vaniman watched his pressure gages with the uncessing vigilance which is a point of honor among Parseval captains; it is doubtful whether he had any experience as to how easily they may get out or order, unless carefully looked after (their many long, thin tubes have a trick of getting entangled and choked); it is even doubtful whether there were any such gages at all, for there was one required for every air ballonet, of which Vaniman had so many, and two or three for the gas space, and very probably he dis-liked the complication and depended instead on a

solitary safety valve.

But, having no aeroplanes, unless he had tous of ballast. Mr. Vaniman had a reason for not opening the
valve. After the high ascension a full into the water
was very likely to follow the escape of gas, and it was

quite logical thus to apply to some somet the principle of the proposed "steel as velops" even to the "Altron," for the strength of whose tough side severeign Verisaan had given as high a figure as in Incel' and a half of water. But without a sufficient number of absolutely reliable pressure stayes, this was extremely delirevour.

The second secon

value. Dut without a numerous manner of absoluted values reliable pressure gages, this was extremely datherous. Another point must be considered. The hydrogen separating facilities at Atlande City were atther principles and the properties of the

Finally, it should be pointed out that the system of air and gas valves required in a large, non-right air-ship is as formidable an engineering problem as the valves of a gasoline motor. But where a gasoline motor gots stalled when its valves fail to work property, an airabilp may burst of fail.

It seems tragical that Vaniman, who has displayed exceptional ingonity in many details, should have fullen a victim to the neglect of proven facts.

At the same time the actual cause of the disaster may have been something that we have not cocked upon. Consider the first trial trip of the "Akron." Who but an eye witness could explain that the failure was due to the accidental dropping of a bag of sand on the water circulating pipe of the engine?

The Latest Triumph of Organic Chemistry Froot were needed of the fertility of chemical science as a source of material gains, such proof nouncement of the suckessful completion, by a commercially sound process, of the synthesis of Indis rober. The importance of this new trophy of the organic chemist requires no emphasis: the general public is well aware of the great demand for rubber, and the difficulty which has been experienced in meeting it. Prof. Hinrichsen, on another page of this issue, gives us some statistical illustrating this point.

The announcement of the synthesis of India rubber omes from the mouth of Prof. W. H. Perkin, son of the illustrious Sir William Perkin, founder of the coal tar dye industry. Mr. E. H. Strange, of the firm of Strange and Graham, of London, England, some time ago organized a group of investigators for collaboration on the problem of synthetic rubber. The list included, in addition to Prof. Perkin, Sir William Ramsay, Prof. Fernbach, of the Pasteur Institute of Paris, and Dr. F. E. Matthews. That a certain hydrocarbon, termed iso-prene, was obtainable from rubber, and could, under favorable, but somewhat ill-defined conditions, he recor verted into rubber, had been known since 1875. remained to find a cheap source of isoprene and to discover the exact conditions under wi merization to rubber could be positively and rapidly brought about. Both these problems have been solved by the group of chemists organized by Mr. Strange. Prof. Fernbach, as a result of some eighteen months of arduous research, has finally perfected a fermentation process by which starchy materials (a kind of skilly made from Indian corn or potatoes and water) are converted into fusel oil. The higher alcohols which are eparated from this by fractional distillation are co verted into isoprene by successive treatments with hydrochloric acid, chlorine and soda lime, and the poly-merization is brought about by contact with metallic sodium. This reaction was accidentally discovered by Dr. Matthews, who left some isoprene in contact with metallic sodium in July, 1910, and on returning from a vacation in September found that the isoprene had turned into a solid mass of rubber.

As regards the cost of the new process, while of course at the present stage it is impossible to give any very reliable figures, the preliminary estimates are most encouraging. We are told that the highest alcoholos separated from the fused oil can be obtained at a cost of not more than \$150 a ton, and it is expected that the synthetic rubber may be sold at about 30 cents per pound. Inasansely as pars rubber is now selling at \$1.35 per pound, the manufacturers of synthetic rubber evidently have every cause to take an optimistic view of their prospects. It would, however, be premature to make any very positive statements with regard to the commercial situation.

to the commercial situation.

It seems fitting that the name of Perkin should be associated with this schlerement. Those who are fassibles with the history of modern industrial chemistry know that England may well be said to have been its birthplace. It was fit william, also Perkin, who laid the foundation stone of the edities of the coal tartification, which have since been resard to such magnificent proportions chiefly by German chemists and been run, in which our England counts have wondered the compared to the popularity of the proposition of the proposi

Institute of the Spenness Newy.—We understand that the Minister of Matthe in Japans is in favor of the building of 35 dreadhoughts of the largest size, the construction to be greated out over the event years from 1914 to 1920. Resmo has it that in addition to the form MINOSOLO bettle-critical new under construction, six other vessels of this class will also be built,

Wairship Seeherg Warnings.—The cruiser "Birming-ant" is doing good service as an toe patrol on the orithmen resembly route across the Atlantic. Recently its cruiser sent a radiogram, amounting the prethese censes sent a radiogram, announcing the pre-spins of three large bergs three miles west of lati-tude 48.08 and longitude 49.58. It stated that another ings berg had been seen affects miles to the southwest. The reports are sent to the Navy Department and theses to the Hydrographic Office.

American Sighbuilding.—Last year's shipbuilding, according to the statistics of the Bureau of Navigation, according to the statistics of the Bureau of Navigation, accounted for 1,702 new merchant ships of all descriptions, aggregating 245,702 gross tons, as compared with 1,306 ships of 395,158 gross tons, built during the year preceding. Thirty-first seed vessels were built on the Great Lakes, including two of 8,605 gross tons, the largest vessels in the lake service. Fourteen steel vessels of 30,039 gross tons, were built for the Atlantic next/se.

Two Buttleships a Year.—It is gratifying to notice that the press of the country is supporting the United States Sanate in its stand against the House of Repre-States Senate in its stand against the House of Repre-sentatives in the matter of the increase of our batile-ship strength. Thus, the Rochester Yieses points out that a programme of two battleships a year pill not even enable this country to maintain its relative naval etempth, and the San Diego Union shows that failure to make the customary addition of two battle-ships a year must ultimately cause the United States to drop from its present position to that of fourth or fifth among the naval powers. fifth among the naval powers.

fifth among the naval powers.

Steady Rise of Gates Lake.—We noted recently
that two sluice-gates in the spillway dam at Gaten
were opened on June 5th, when the lake stood at an
elevation of 256, 5ee above see level. These gates were
closed on June 19th, and in the week following the
lake had rise to elevation +29.257. The lake may
now rise to an elevation +37 feet, 4 inches, at which
level it will rescut the sills of the guard gate of the
upper locks at Gaten. It is expected that these gates,
in both the easterly and westerly slight of locks, will
be completed and closed before the water reaches the
ellis, in which case the filling of the lake may proceed
continuously throughout the risky season.

continuously throughout the rainy essaon.

The Ever-present Bail Peetl.—H. W. Belknap, Chief Impeotor of Stefety Appliances of the Intertate Commerce Commission, in his report on the cause of an accident on the Great Northern Railroad on Desember 30th last, after ceiling attention to the constantly increasing number of rail failures, due generally to structural defects, says "present specifications and tests, in so far as the detection of inspitulation seams within he rail is concerned, appear to be inadequate. It seems to be time that some definite action were taken toward climinating this source of daager and securing structurally seund rails." The cause of the sectioning structurally seund rails." The cause of the sections of the vas, primarily, a defective and seriously seamed 80-pound Bessmer steel rail.

Channel Steamers With Geared Turbines.—The new Channel steamers "Normannia" and "Hantonia," built for the London & Southwestern Railway Company, have been equipped with guared turbines, using a gear of the same general type as the Maville-Madjale Thay show a consumption per shaft horse-power Thay show a consumption per shaft horse-power of the same general type as the MavIlie-MoAlpin. They show a consumption per shart horse-power per hour of 1.34 pounds of coal, when the vessels are being run at a maximum speed of 10 to 20 knots. The water consumption for the general tributes was 12 pounds per horse-power per hour, as compased with 16.1 pounds in similar turbine-driven sistences of about the same see and speed, which use a direct drive. Carvillobervation in the passedgar quarters falled to reveal any inconvenience of vibration or achos due to the mechani-monvenience of vibration or a colos due to the mechanical reduction gear.

cal reduction gene.

Now Haves Hacetrical, Regularsent.—Associating to left, W. S. Marrays, Hacetrical Regularse of, the New York, New Haves and Hacetrical Regularse of, the New York, New Haves and Hacetrical Related, the power leaves for its electrical lines between Stamford and New York, has a capacity of 8,000 homes-power for the passession of engine-phase servent. In 1918, 553 mins of succious the passession property of the property of the property of the Park This power for the passession of the passession between the passession of the passession passession of the passession t

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## Electricity

Sheep Shearing by Electricity.—A novel application of electric power is that of shearing sheep and olipping horses. The apparatus consists of a suitable electric motor connected by a flexible shaft to the ordinary shearing tool. The motor is of the two-speed type, and can be employed also to drive a rotating brush for ing horses, or a small emery wheel for grinding

Riflect of Light on the Resistance of Selenium.— The effect of light on the resistance of selenium is well known, and has been made the basis of photo-telephone devices for transmitting sound-waves over a beam of uerous for transmitting sound-waves over a beam of light. It has recently been shown that the changes of conductivity in a certain variety of selentium can be explained by assuming that the light pencitates to some distance into the conducting layer. The effective depth of posetration is about 0.014 millimeters, and filing or sandblasting the selentium surface increases the conductivity.

High-voltage Tras mission in England.--- A pioneer installation of the Thury direct current series system of electric power transmission in London has been running steadily for about fifteen months. In this running steadily for about fifteen months. In this system direct current at high voltage is transmitted by two single-conductor paper-insulated underground cables. The circuit is "all-metallic" normally, but in case of breakdown of one of the cables the earth can be used as a return conductor, by permission of the municipal authorities. The cables are, however, designed to carry 100,000 volts, with special precautions against breakdown at the joints. A number of generators in series are used, having an electromotive force not exceeding 5,000 volts each, which is regarded as the limit of safe working on a single commutator.

The Magnetismes of Pernanet Magnetis—In the

not exceeding 0,000 voice each; where a commutator.

The Magnetizmen, of Pornament Magnets.—In the course of a lecture at the recent meeting of the British Institution of Electrical Engin, — held at Glasgow. Dr. Bylvanus Thompson stated that — permanence meaning of the country of the countr Dr. Sylvanus Thompson stated than "--, print at Unagow.

Dr. Sylvanus Thompson stated than "--, premanence of magnets depended on the quality of ..." real, the shapes and dimensions of the magnet, the beat "--, all-ment, the maturing, the method of preserving tailment, the maturing, the method of preserving tailment of the preserving ta of short bars is less than that of long ones: "Short bars have no memory," as Lord Kelvin put it. A good permanent magnet steel should retain an intensity of magnetization of shout 1,000 C. G. S. units, and the coercive force increases with the carbon content of tha steel. The lecture included a masterly review of the properties of steel as revealed by its microstructure.

Study of Committation by the Oscillograph.—The oscillograph study of the generation of electromotive force and current in the armature coils of electric generators gives valuable information on the proper setting of brushes, the location of interpoles, etc. sthod of studying commutation by the oscillograph is suggested involving the use of a special armature coil wound in the same slots with the working armature coil which it is desired to study and terminating in slip on when it is executed to study an eleminating in any rings for making contact with the oscillograph circuit. It is proposed to provide an "indicating coil" of this kind, not only on special generators for teaching pur-poses, but also on all large machines, and on all machines working near the limits of commutation, in the course of the construction of these machines; just as the steam engine builder always provides indicator cocks on his engines.

French Aeropiane Wireless Experiments.—Some very Fresch Asreplane Wireless Experiments.—Some very successful experiments were made with varieties tolegraphy upon aeroplanes in France at Chartres, using a biplane mounted with the new type of transmitter designed by M. Rouget. The aeroplane started from the serodrome at Chartres with the inventor on board, ploted by Frants. In all, a dight of about 100 miles was made, around the country, with 20 miles as the greatest distance from the conter. A small wireless post had been put up at the aerodrome and the army officers thus lowe in touch with the fiver. The antenna ers thus kept in touch with the flyer. The antenna at the ground post was less than 100 feet long and was stretched at a height of 30 feet. The officers could at the ground post was less than 100 feet long and was stretched at a height of 50 feet. The officers could take all the observations made by the pilot en route and the signals were quite clear. On the scroplane the apparatus used an antenna wire about 100 feet in length, hasping down from one end, and the musical spack method was employed. The wireless apparatus, together with a ministure dynamo, weight subt 70 pounds. The small attentance of 200 waste and 110 volts in coupled to the scroplane motor directly, by means of a new dutifit capture. A small transformer raises the voltage and differ supplies 80,000 volts to the apparatus for changing the condensure. In M. Rouget's new design, all the high caused in localized in a small space so as side to indicate the pilot, as was inerestofore found. The transformer the pilot, as was inerestofore found. The transformer the pilot, as was increased up in 10 ecospies. A safety device can cut off the virie, should the scroplane decound very rapidly in some of sections.

## Assemantica

- A New Altitude Record.—At the International Aviation Meet held at Vienna, Csakay (the assumed name of Lieut. Miller) reached an altitude of 13,779 feet on June 29th with a passenger. The best previous altitude record with a passenger is that of Prevost at Courcy, 6,858
- A Wright Memorial Prize.—As a memorial to the late Wilbur Wright the Royal Aeronautical Somety is solicit-ing subscriptions for an annual money prize to be awarded for the best lecture on aeronautics. The lec-tures will be known as the Wilbur Wright Memorial
- A Nine-hour Zeppelin Trip.—On June 27th the Zeppe-A Mine-nour Zeppelin Trip.—On June 27th the Zeppe-lin dirigible "Victoria Luise" made a nine-hour trip with twelve passengers directly out from Hamburg over the North Sea. Starting at 6.15 o'clock in the morning, the vessel passed over Helgoland at 9.15. She landed at Hamburg again at 3.15.

The War Department and Aeroplanes.—It is not probable that any advertisements for the purchase of army aeroplanes will be usued in the near future. The pohey aeroplanes will be issued in the mear ruture. The poncy of the War Department has been to purchase aeroplanes only from American manufacturers whose products are known to be suitable for military service. Orders have already been placed which will obligate all of the available appropriation remaining on hand and no fur-ther purchases can be made until the next army appro-priation has been passed and approved.

An Accident Due to Air Wash.—During the first eroplane meeting held at Rheims, in 1909, aviators for the first time realized the dangers of flying in the wake of an aeroplane. Although the perils that lurk in the wash of a flying machine are fully appreciated, nevertheless a serious accident occurred at Villa Coublay, near Paris, on July 5th last. Lieuts Briez and Burlez near Paris, on July 5th last. Lieuts Briez and Burles of the French Army started on a flight to Befort, each in a monoplane. Lieut. Burles had attained an attitude of about 600 feet, passing the other man at gracter speed, 100 feet higher, foreing a current of air downward and causing the machine driven by Briez to lose to suilibrium. The monoplane crashed to the ground and Brico. "seed two broken legs, a fractured jaw and injuries to his othe. He is expected to recover.

The Dirigible in Warfare. "The Slampa of Turin, says the Times correspondent of 16 +, publishes a dispatch from its special correspondent at Bengaz, Count Savorgnan di Brazza, which furnishes an interesting description of the work of a dirigible in actual warfare. The "Pl" left its hangar at 6 in the morning carrying on board ndante Peuco and the pilots, Capt. Saymandi and Liout. Benigai. The object was to carry out an offensive reconnaissance, for which purpose the dirigible was supplied with bombs. Rising over the sea to the height of 1,000 meters, it turned eastward toward Koefla, and, passing over that oasis, was able to accertain that, for the moment, it contained none of the enemy. Making a wide detour, the "P1" turned toward enemy. Naskung & now of Stidl Mufta, in the neighborhood of which, both at the foot of the Djebel and on the plain, the principal tents of the Turk and Arab camp lie scattered over a considerable space of ground. No sooner had the edge of the wavanpment been reached than a number of little juffs of white smoke were observed on the ground beneath, and the unmistakable canadide of rife fire made itself heard in spite of the noisy roar of the simplips motor. The Turks and noisy roar of the airship's motor. The Turks and Arabs had begun a violent fusillade against the dirigible, Arasis and regun a voice training against use direction, which promptly answered by dropping its first bomb. A flash of fire and a dense cloud of smoke rose well in the middle of a group of tents, from which men could be seen hurri-city escaping. A second bomb followed the first, producing the same effect. The Turks, reslizthe irst, producing the same eneet. The Turks, resulting the futility of their rifle fire, brought their artillery into action. From the edge of the sand-dunes two flashes were suddenly seen, followed by others. Evidently the artillery had been prepared beforehand for this purpose, for the shells, instead of bursting low, after following the usual horizontal parabola, took an almost vertical line of flight. Ordinary field guns are not suited to such a use, as they cannot be given the necessary inclination; the Turks had, therefore, posted their guns inclination: the Turks had, therefore, posted their grain on the actual slope of the sand hills, burying the tail of the carriage deep in the sand to prevent the overturn of it rendered a nearly vertical fire possible, made the laying of the gun very difficult. In fact, in spite of all the preparations made in advance, the aim of the gunness was wild and their fire quite innousous. The dispite of the other hand, let fall other bombs, which seemed to be as effective as the first. The accountage moreover, while carrying on this serial combat, which lasted slmoet an hour, were able to accomplish in the most complete fashion possible the chief and of their vayage—that is to say, an exact reconnaissance of the number of Turks and Arabs that had gathered in front of our lines.

# "A Shadow in Court"-The Sequel

By William F. Rigge, S. J.

ON February 4th of last year there appeared in this journal an article under the caption "A Shadow in Court" It instanced a case in which the liberty of an accused man hung upon the accuracy with which an astronomer could determine from the position of a shadow the exact time at which a photograph had been As the account was written immediately after the first trial, the subsequent history of the case is not without interest. A brief recapitulation of the facts will obviate the necessity of referring to the original number. E was arraigned on the charge of hav-

ing placed with malicious intent a suitcase con-taining dynamite upon D's porch between 2 and 3 o'clock on the afternoon of Sunday, May 22, The State produced only two witne girls about 16 years of age, who stated that while walking in the neighborhood shortly be fore three o'clock, they saw a man answering E's description carrying such a suitcase. The attorney for the defense found upon investigation that the girls at the time were coming from a church a mile away. They had attended services there, and had posed for their photographs twice in front of the building. A prominent shadow in one of the pictures gave the attorney the idea of consulting an astronomer in the hope of finding from the position of this shadow the time at which the exposure had The astronomer testified that the time was within one minute of twenty-one and half minutes after three o'clock. In that case the girls could not possibly have seen the acd at the place and time they averred. This testimony served to split the jury.

At the second trial substantially the same testimony was advanced as at the first. The attorney for the prosecution, an expert crim lawyer, realiz ed that his only hope of suc cess lay in invalidating the evidence advanced in the name of science. For this purpose he be-littled the calculations and predictions of scientific men generally, and by his secusion and witthe men generally, and in inclination and well the same the fury in inclination in the same that the unanimous verdict of "Guilty" drew a sen-

tence of lifteen years in the penitentiary The defense then appealed to the Supreme Court of the State. While the sifting of the evidence was in progress, the first anniversary of the taking of the photograph occurred, and it gave the expert an opportunity of verifying his findings. The time he had assigned was in error only a quarter of a minute

Some months later the Supreme Court decided the accused had been convicted upon sufficient evidence. In preparing for a third trial the prosecution called upon G. D. Swezey, professor of astronomy at the University of Nebraska, to remeasure the position of the shadow and recompute the time. Prof Swezey, narrating the event at a public meeting of the Nebraska Academy of Science, held in Lincoln, on May 3d last, said that he studiously refrained from consulting or even referring any of the former measurements or findings until he had completed his own calculations. The outcome was that he obtained a difference of only twenty nine seconds, thus falling decidedly within the one minute that the defense had allowed as a probable error. The State then

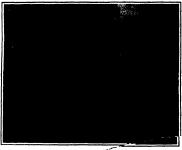
bandoned the prosecution On May 22d last, the second anniversary, the shadow was again on the same spot it covered at the instant the original photograph was It will be there each anniversary as long building stands and the point that cast the shadow, as well as the wall mon which it fell, remain in their original position

Note that in the first and third pictures the left corner of the shadow is exactly in the mid-die of a weather board, and that it is below that spot in the second picture and as much above it in the fourth The computed time, therefore, was certainly correct to the minute, and probably so even within a few se

# Resuscitation from Electrical Shock By T. Commerford Martin

F late years, the increased knowledge of electrical phenomena and the riper experience in handling electrical energy, have done much to lessen the number of fatal accidents from electrical shock. On the other hand, the extended introduction of electricity into the arts and industries, the establishment of circuits of high voltage for transminumerous circuits of high voltage for transmission and flustribution purposes, and in general Photograph taken at \$221%, May 254, 1912, vindicating the astr

the preference given to the alternating current for a wide variety of work on account of its flexible use eve large areas, have brought a much higher degree of risk than obtained under the old regime of direct current of relatively low potential. The net result been an apparent swelling of the death roll to an abno mal extent, although in proportion to the universalized employment of electricity, the percentage of shock and fatality has doubtless fallen considerably. There are no exact statistics available on this important sub ject, but in view of the part that electricity plays in modern life, such data might well be increased in some of the inquiries of the United States Bureau of the



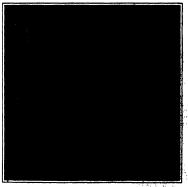
The liberty of an accused man lung upon the shadow at the right. An astronomer testified that the picture was taken on May 22d at 8 21%





One minute before the computed time.

One minute after the computed time.



In 1895, when the present will liters, the Electrical World, impre of its edi necessity for popular instruction on the subject, issued in broad sheet form a chart of instructions to be folred in cases of apparent death from electri and a revised version of these rules was issued by the same journal in 1902. Without question, the use of these rules for securing resuscitation was successful in a great many instances; and the demand for the charts, circulated gratuitously, became so great, no one can now say how many thousands were printed. They are to this day a prominent feature on the walls of electric power plants throughout the world. It hap-pened, however, that this chart was based on

the Sylvester method, directing that the victim of the shock should be laid on his back, and his chest expanded and compressed by drawing his arms forward and then pushing them b against his ribs. Serious doubt arose in the course of time as to the real virtue of this meth-od, and meanwhile the Schilfer method attracted attention as probably superior is It consists simply in laying the victim on his belly, and then applying pressure rythmically on his loins and lowest ribs. This is known as the "prone pressure" method, and it was soon taken up in Europe, although both there and here the Sylvester method persisted. A crisis was reached about three years ago, the older charts were no longer even out, and it was felt that something must be done to secure unanimity; in doing which the percentage of cases of resuscitation would obtously be raised. When the matter, or the situation, came to the notice of the National Electric Light Association, with its 1,500 private corporations engaged in public service in the United States, to the tune of 100,000 employees, \$2,500,000,000 investment and 1,000,000 or more customer took the problem up with commendable activity, and at once organized the forces of safety. Two years ago it called into conference the leading States Army and Navy, the United States Army and Navy, the United States Bureau of Standards, the American Museum of Safety, and the American Medical Association; and the authoritative dealing with the problem was relegated by unanimous vote to the last named powerful organization, the National Electric Light Association and the American Institute of Electrical Engineers. These three bodies selected their representatives as members of a commission, its expenses to be borne entirely by the National Electric Light Association, and then the work was taken seriously in The members are as follows: 1)r. W. chairman, Professor of Physiole Harvard University, Dr. George W. Crile, Professor of Surgery, Western Reserve University; Dr. Yandell Henderson, Professor of Physiology, Yale University; and Dr. S. J. Meltzer, ead of the Department of Physiology and Pharmacology in the Rockefeller institute of Medical Resourch—the four from the American Medical Association. Dr. E. A. Spitska, Director and Professor of General Anatomy, Daniel Baugh Institute of Anatomy, Jefferson Medical College, and Mr. C. L. Eglin, Past-president of the National Electric Light Association —named as representatives of the National Electric Light Association. Dr. A. E. Kennelly, Professor of Electrical Engineering, Harvard University, and Dr. Elliu Thomson, Electrician, General Electric Company-nominated by the American Institute of Electrical Engin W. D. Weaver was elected secretary by the other members of the commission. It is quite needless to point out the distinction and capac-

ity of this able body of men. Three problems confronte ed the commission, and in reality only one of them has been dis-posed of thus far, in the issuance of the new rules, which are based wholly on the Schiffer rules, which are based wholly on the Schäfer prome method, appliedwed because of its superior stimplistry in application, easy performance by dayness, slight risk of singury to the subject, large spatitation of the lungs, and absence of streuble from the failing of the toogue back into the sity passage. The new rules have been imposed, both in blood shoot and to vest pocket form, with illustractions, of the method. These are copyrighted by the National Electric Light n to secure integrity of the rules, as are issued at cost, but on request anyone can senire permission, without charge, to reprint in any form, as the commission desires to give the s the widest vogue and publicity. documents were formally presented at the Ma-tional Electric Light Association convention at

dos en page 66.) 

# The Wirelessly Directed Torpedo

Some New Experiments in an Old Field

By Benjamin F. Missner

N the year 1897, when wireless telegraphy was in its infancy. Emeat Wilson, an English actiontic, was granted a patent on a gratem for the wireless control of dirighte safe-frequeited vassels. The primary object of the invention was to provide a weapon for use in awal warfare, which, if in the form of a dirighte torpede controlled from a shore or ship wireless installation, would be most deadly in its effect on a hostile fleet. Wilson's was the pioneer patent in that branch fleet. Wilson's was the pioneer patent in that branch controlled the state of radio-telegraphy now commonly called radio-telamination. Since then a large number of patents on telamination are been taken out by various inventors, and several of those who have been as fortunate as to possess the means, have developed their respective systems in the effort to realize their possibilities.

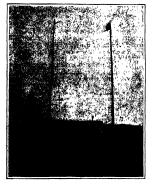
A STATE OF THE STA

Gardner of Engiand, Wirth of Germany, Gabet of France, Roberts of Australia, and Tesla, Sims and Edison of the United States during the last ten years have strenged to solve the problem in a practical way. Gardner, Wirth, 'Gabet and Tesla have used their systems on boats intended primarily for torpedoes, which they control by Hertrian waves. Sims and Edison, with the cooperation of the United States Government, developed a system for controlling a dirigible torpedo through a trailing conductor, and Geberts has applied his system to dirigible balloons. These inventors have had various degrees of success in their endeavor to perfect their inventions, but apparently nonhas reached the goal. It is true they have controlled the movements of vessels without the aid of wires, but at the best the apparatus worked apasumolically, unsatisfactorily, and the greatest distance at which their vessels were controlled has not exceeded a half mile. But why, we may ask, have these learned men failed to secure the desired results when wireless telegraphy, the mother of radio-telautomatics, has made such wonderful progresses.

By analyzing the situation we may find that early in

By analyting to situation we may hat the art potential-operated receiving devices, such as the coherer, which was developed from Branij's tube, were usedwhich permitted the use of recording mechanisms. As the art progressed new receptive devices were discovered which when used with the most sensitive of all electrical instruments, the telephone, proved the coherer comparatively insensitive and unreliable. Coherers and relays were discarded and replaced by the devitors and telephones, which provided a means of signaling over vasity greaterdistances with the same amount of transniting power. The new devectors while forming a very destrible combination with the telephone, were entirely unsuitable for use with relays, and, therefore, those men interasted in the control of mechan-

Isms were compelled to retain the coherer as the receiving detector. This is the reason for the poor success statused in the field of radio-telautomatics. The coherer, being spasmodic ("somewhat feminise") in its action, sometimes operates when the transmitting key is pressed, and sometimes operates when the signals are sent, probably steering the boat to starboard when the signal should have sent her to jour, or storning the engine when full sneed was desired.



House-boat used to demonstrate the Hammond system of torpedo control.

The coherer has, therefore, been the barrier to the realization of the invention's possibilities.

During the summer of 1911, J. H. Hammond, Jr., a young inventor of Gloucester, Mass., carried on experiments on the control of a dirigible boat, with a considerable degree of success. With no great amount of transmitting power (1.5 killowatt) and comparatively



John Gardner and his dirigible boat

poor antennae (80 feet and 30 feet, respectively), Mr Hammond was able to keep the bost under perfect control at distances up to and over a mile.

The boat, which has a displacement of over eight tons and a speed of about five inlies per hour, was steered over a preservanged course during both day and night in all equilibrais of sea and weather. The course was by no measuresistample, following as it did circles around buoys and a complete circle around the harbor. Flaing and other vessels were continually moving about the harbor, but no great trouble was experienced in avoiding them and at the same time keeping on the prentranged course. It was found possible to steer the boat directly against either of several upright spar booys in mile from the trunsmitting statuo. At night, lights, automatically controlled by the steering mechanism, kept the 'helmsman' at the transmitting key informed of the boat's action. The steering of the boat was accomplished by sending Hertain wave impulses, which, affecting suitable receiving apparatus and switching deviews, controlled an electric motor mechanically connected with the steering wheel. The radder could, therefore, he made to move to port or startoard, or could be set at any intermediate position at will from the trummitting station.

The success of Mr. Hummond's experiments is due largely to the fact that he early realized the manifiability of the filings coherer, and adopted a more sensitive and reliable types of detector, manely, the mercuristered disk coherer, which was invented by Sir Offiver Lodge and Dr. Mutrhead, and used in their system of syntonic Wireless telegraphy. While not entirely suitofactory, the Lodge-Mutrhead coherer proved a great divance over the fillings coherer, and no difficulty was expecienced in operating the sensitive relay used with it at distances up to two miles.

Mr Hammond, encouraged by last year's work, is building and equipping a large station at Gloucester for further experiments in teleutomatics, and with noninterferable systems. Two towers 340 feet high for supporting the aerial wires are being constructed, and eight complete transmitting and five complete receiving sets will be available for use in experimental radiotelegraphy and telephony.

An entirely new receiving detector and a sensitive relay have been developed during the past winter which

will greatly increase the range of operation. These instruments, being electrically and mechanically stable, will require no adjustment.

In addition to the wheless equipment, a bont of special design is being built, which will travel at a rate of thirty miles per hour. This boat will be equipped with the wireless control apparatus and will be operated from the station. A 24-inch searchight and selemin cells of extreme sensitiveness will also be used in controlling the bont, by sending light wave impulses, the wave length of which is of the order of 1/44,000 of an inch in length, instead of or in conjunction with impulses of electro-magnetic waves whose length is of the order of 3,000 feet.

Considering the amount of work that is being done along the lines of torpede control in the United States and in forcepe, and the progress that is being made in radio relautomatics, it is very probable that the dirighte torpede will, within a few years, occupy a prominent place as a deadly weapon in naval warfare it would be absolutely invisible except in the very rure case of an absolutely



Enumerative apparatus need his wireless control of the boat.



A. J. Roberts and the balloon which he controls by wireless,

# The Business Side of German Science-VIII

Making Money With the Aid of Technically Trained Men

By Waldemar Kaempffert (Concluded from page 96, July 19th, 1919)

T III8 is the cighth of a series of articles, verticing by the Managino Editio of the Scientific Ambilities, on German industrial conditions. The above as an abroad by the publishers for the capress purpose of gathering the material on which the articles are based. In this word the articles are based. In this word the articles per played In this and the article to follow, part played by the technically trained man in Gers In this and the article to follow, the husiness is putured

The amazing industrial development of modern Gerany is to be attributed in large part to technical edumany is to account to application of science to business. Capital and sevence work hand in hand. Every one of Capital and sevence work hand in hand. They only in the great chemical discoveries of our times, most of them made in Germany, are the result not of hap-hazard experimenting, but of systematic research that has meant the expenditure of princely sums. All Gor-man manufacturing 4s so thoroughly saturated with mon minuture scale the mall producer practises on a minuture scale the methods of his larger rivals.]

The Story of Indigo.

The pertinacity with which a German chemical company will carry on investigations for years, fully convinced that ultimately the goal will be reached, finds no more brilliant example than the development of a commercial process for the annufacture of artificial indigo. In the eighties Prof. von Baeyer of Munich surveied in producing synthetic indigo—a great achievement. Two of the most powerful chemical time of the day tooks unto the twention almost time. great achievement. I you of the mions powerful cascan-cal firms of the day took up the invention almost im-mediately. They set chemists and engineers at work. After much time, money, labor and thought had been spent in endeavoring to base an industry on you Bacyer's discovery, it was found impossible to produce indigo in commercial quantities by the means that he had indicated The firms who backed the invention were discouraged perhaps, but not beaten. When Heu-mann discovered a method of obtaining synthetic indige from the phenylgiyeins, a commercial future for artificial indigo seemed to have dawned. Heumann was practically taken into partnership with capitalists who recognized the immense possibilities that lay in his discovery. Without them he would have been able to do nothing. Seven years of hard work elapsed before the first indigo could be manufactured by Heumann's process for the market

It pays to spend money and time so lavishly. The amount of indigo manufactured to-day would require the cultivation on an area of more than one-quarter of a million of acres of land in the home of the indigo plant As late as 1897 thirteen million pounds of indigo were grown, valued at twenty million dollars. Not more than one-sixth of this quantity of natural indige is now marketed. The Calcutta harvest for example, in 1866 amounted to 158,922 maunds and in 1909 to only in 1880 amounted to 1883,02 manues and to 1983,000 manuels, a manuel being \$2.14 pounds. In Java, in 1888, there were 122 indigo plantitions; in a few years they were reduced to 28. A harvest which in Java amounted to 12.500 boxes in 1898 was reduced. to 2,015 in 1908 In 1897 Germany imported \$3,200,000 worth of natural indige, in 1909 only \$160,000 worth. On the other hand the export of synthetic indigo in Germany amounted to nearly \$2,000,000. The same story is repeated in the history of alizarin

In 1888 France exported about \$600,000 worth of mad-der. Te-day madder is almost unused. Instead, mil-llous of pounds of artificial alizarin are manufactured, seven-eighths of the entire output in Germany. In 1892, 320,000 pounds of cochineal were used in Ger-In 1807 the use of cochineal had dropped to about 34,000 pounds

Reducing the Cost of Old Processes.

The men in the research laboratories of German ufacturing companies are concerned not only with the discovery of new compounds and the inventing of new apparatus, but also with the simplification and the

cheapening of old and long established processes. There has been a vast improvement, for example, in the manufacture of salicylic acid, of which one hundred and twenty-nine tons were exported from the German Empire in 1882, and five hundred and two tons in 1905. Although in twenty years the amount experted in Although in twenty years the amount experted in creased four times, the price of the acid dropped to one-sixth of what it was originally. In 1900, again, anti-febrin was worth about seven and one-half times what it brought in 1905. Vanillin, which has taken the place of vanilla extract, and which has been pro-duced artificially for the last thirty years, was worth about \$1,800 a pound in 1876; in 1902 it was worth about \$8 a pound. These remarkable reductions in the selling price are to be attributed entirely to sim-plified methods of manufacture. The result of the cheapening has been the opening of a much larger market than could otherwise be supplied.

market man could otherwise be supplied.

In the dyestuff industry the advances which have been made in the last decade in thus improving original processes is perhaps more marked than in any other phase of German manufacturing. Most of the other phase of German manufacturing. Most of the improvements have resulted in securing a greater de-gree of fastness to washing, light and similar agencies. Thus, in dyeing cotton the want of fastness of the earlier "sait" dyestuffus, One result of these many attempts was the introduction in 1884 of Vidal black. Immediately a wonderful development of "sulphide" dyestuffs followed. The cotton dyer obtained cheap dyestuffs followed. The cotton dyer obtained casespies of much greater fastness than those of the old "sail" class, which, therefore, were gradually displaced. Scoper or later the sulphide dyestuffs will have to give way to the newer vat dyes of the anthracene and indigold classes when they have been cheapened sufficiently.

etimes the discovery of a new process may lead rival manufacturer to begin a systematic study of an old process in order to improve and cheapen it to such an extent that it will not be crowded out of existence. An example is to be found in the making of sulphuric acid. When the Badische Company devised a method of making sulphuric and commercially by the contact process it seemed as if the old lead-chamber was doomed. But the story of the competition between the electric light and the gas light was repeated; a method was found of improving the old lead-chamber process and increasing its efficiency, so that it is still worked side by side with the contact process.

Testing New Products Before Marketing Them. The introduction of a new dye, a new drug, a explosive, and new fabric is not conducted in a hap hazard way. Business men the world over realize that there is an ethical side to the selling of goods. The there is an ethical size to the sening of goods. Asset old days when a salesman was simply a hired liar who stopped at nothing in selling his goods are over. A modern manufacturer not only refuses to misrepresent his products, but he will not even market them if they are not at least as good as the old.

In connection with every research department in Germany will be found a testing laboratory—a place where a newly discovered product must prove its worth.

A new dyestuff is subjected to hundreds of practical ests before the public ever hears of it. It is tested for fastness by exposing it to the sunlight by ascerta how it withstands ordinary alkalis and much washing, and by noting its effect on leather, paper and fabrics in general. As a result of hundreds of tests it may be revealed that a new chemical product is not as good as an old one, or that it is injurious in some way. Despite the fortune that may have been spent in devis-ing a process for its manufacture, it is cast aside immediately.

The introduction of new drugs and medics poses this moral obligation to a high degree. Hoechst will be found perhaps the largest works in the world for the production of medicines and chemi-

cals that are used in the ordinary physician's pra-Here will be found remarkable laboratories for to Here will be found remarkate anoratories her tenume the qualifications of a new virtus, serum, drug, of the cotic which is to be used in curing human like "The laboratory physician works hand in hand with the chamist; the physiciogist with the physicist. No best cuemist; are payatologist with the physicist. No bec-teriological inhoratory, no hospital is conducted with more ecrupious care. A fine stud of thoroughbred horses, from three to eight years old, are an indispens-able aid in supplying seen and anti-toxins. The there-rettle assets discourse of the conduction of the con-patitle assets. peutic agent discovered are rigidly controlled partir in the Institute for Experimental Therapeutics of Frankfurt, partly at Hoechst itself. Diphtheria serum, Frankrurt, party at Hocenst level. Lugarioera serum, anti-dysentery serum, auti-posunococci serum, anti-streptococci serum, scarlet streptococci serum, tetanus serum. Robert Koch's tuberculin preparation as well as Ehrich's salvarsan are here prepared and carefally sted before they are sent out

# Analysis of Raw Material

No longer is raw material bought simply by quantity and with only the most superficial regard for quality, Mass production is the reason. When the output of a steel mill or a sugar factory is millions of tons a year, it pays to save a cent a ton on raw material; it pays to determine beforehand and exactly how much of the raw material can be utilised to produce a certain amount of goods. The old-fashioned miller for example used to thrust his hands into the grain that he bought in order el its moisture; or he would grind it between his . It is perfectly obvious that by such crude methteeth. It is perfectly obvious that by such crude methods be could not determine differences in mosture of one or two per cent; yet such extremely alight differences may be of untold importance in modern miling. Ortain is sold by weight. If it contains a large percentage of water, the miller is simply buying moisture which easily evaporates. Hence, we find that the modern miller—and particularly the modern German miller—celeutifically analyses the grain that is offered to him. Not only does that analysis govern the price to be paid for the grain, but it determines its keeping qualities. When grain is to be stored for a long time, it is not a matter of indifference whether it contains fourteen per cent or sixteen per cent or contains water. Experience has shown that wheat containing as much as fifteen per cent will keep for a long time, whereas wheat containing only sixteen per cent—only

whereas wheat containing only sixteen per cent—only one per cont more—may suffer.

Only a very wealthy firm, it may be argued, on afrord to pay a seientifically trained man to test raw materials in this way. That is true enough. But the manual firm in Germany proceeds estentifically nevertheless. Much valuable technical assistance is given therees. Buth Valuable consumal assessments is given by manufacturing firms to small consumers of their products who are not able to engage a chemist or a tachnically trained man regularly. Thus the item of Simon, Bühler und Baumann of Frankfurt employs a chemist whose chief duty it is to assist breweries and chemist whose cases only it is to assume between and millers to reduce their cost of manufacture by analys-ing raw material and waste products, and submitting the results of his examination. Moreover, there are ns of consulting technologists whose service be engaged for no very large sum.

be engaged for no very large sum.

The Sociological Side of German Industry,
There is a sociological sapect, to German industry,
There is a sociological sapect, to German industrial
science which is obscured by a national prosperity expressed in exports that amount to millions and millions of marks a year. Each new coal tar drug that is
unsatitude, such new method that is discovered for the
utilization of waste material, means work. It is no
annil tast to provide place for one-third of a million
human beings, who annually demand a chance to earn
takel living. The fact that there is so little poverty in
Germany, that a task is provided for every able-bodied
ann, is due in large measure to the laboratory administs man, is due in large measure to the laboratory scientish in the employ of the large manufacturing companies.

# Macquarie Island

PUBLIC attention has recently been directed to Mac-P quarie Island, owing to the fact that the Mawson Antarctic expedition, on its way south, established a wireless telegraph station here, so that the island is now in daily communication with Hobart, Tasmania. It was hoped that this station would be able to relay messages to a wireless station at Adelle Land, the base of the expedition on the Autarctic continent, but this plan has proved impracticable. It is said that magnetic disturbances due to the proximity of the south magnetic pole make communication between these two points impossible. However, the Macquarie Island station has proved of some value to shipping in Australian waters by giving timely notice of storms coming up

Macquarie Island, which belongs to Tasmania, is about 750 miles southeast of Hobart, and is, therefore, about 750 miles southeast of Robart, and is, therefore, a halvary point for expeditions proceeding to the Antarctic on the Antarctian side. It was visited by the expeditions of Sout and Shackitsion, as well as by Dr. Mawon's party. The island is about 22 miles long by 5 broad, and bear a rugged conscillent sizing sheer out of the water to a height of 1,000 feet in places.

According to a recent consular report this island has been lessed by the Tasmanian government to Mr. Joseph

Hatch, who has established here the incretive busine Plattic, who has established here the increasive business of entohing penguins for their, oil; probably the most southerly industry of the worth except certain fish-eries. It is end that there are 80,000,000 penguins on the island. The oil is obtained by builting the enrossess the island. The oil is obtained by beiling the corresponding to expand the contract of the con

# Tarrenumbence

iller are not responsible for state correspondence column. Anonymous and be considered, but the named will be softhheld when so desired.

## reus In Aeres

To the Editor of the SCHNTIFIC AMBRICAN:

opes of your recent editorial on the stress in mess. I note that the values in my table in the pages. I more that the values of my table in the previous Assession of August 20th, 1911, have to mailtiplied by 22/15 to make them correct. The reset formula used in computing those values is t, but by an oversight the factor 22/15 was omitted right, but by an oversight the mount of the more than a substantial appears to libersfore, the warning in your editorial appears to large for the warning in your editorial appears to large for the warning in your editorial appears to large. All the more

nos Club, Washington, D. C.

# An Explanation of the Quimby Accident

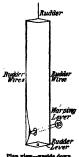
To the Editor of the Sounvivi American:
As measure of the avision meeting at which Mr.
Willard and Miss Quimby came to a violent end, I had unesual facilities for making prompt examination of the weeksness and I wish to make the following report in the hope that all monoplane constructors will avoid such a defect in construction as existed in Miss Quimby's Wilder recognition. ot monople

Bléfriot monophane.

Referring to the rough sketch which I inclose, which is a plan view of the machine upside down as it rested in the water, I found that one of the two left-hand control wires (all of the Bléfriot control wires are in duplicate) had eaught over the lower end of "the warping lever. Of course this is a defect in contruction as the rudder wires should either have been put farther rudder wires should either have been put farther and the rudder wires should either have been put farther the service.

away from this warping lever, or else been run through guides at this point so as to prevent them becoming entangled with it.

happened before in a Blériot monoplane is because the warping lever. d in Miss Q machine, was not the con-ventional Bleriot "cloche" which was a feature of my 70 horse-power mono plane, and all others I have ever seen. I noticed this departure from con-ventional Blériot practise when I examined Miss Quimby's machine before the flight. I have also called the matter to Mon-sieur Blériot's attention a letter under this



date. It is some satisfaction to know definitely the cause of this accident and I assure you that I hardly think there is a chance of my being mistaken. I was the first one to examine the wreck and this rudder wire was caught over the control lever when I looked at was caught over the control lever when I looked at the machine. And from what happened in the sir, for I saw the whole socident, I am convinced that this was the difficulty. At any rate, the construction should not have been such that this wire could possibly have been looped over the control lever whether in the air or at any other time. It is too bad that all sen-place socidents do not leave usuch a clear record of their BARLE L. OVINGTON.

rton Highlands, Mass.

[We have had an interview with Miss Quimby's meunic, and the following is his version of the accident: Miss Quimby had returned from her flight to the Boston Light and had made one big circle over the field, at a speed of 70 to 80 miles an hour. She was flying without banking the machine, which was unbecessary on account of the size of the circle she was describing. At the beginning of the second round the mechanic waw Mr. Willard full out. Believed of his weight the anothine instantly dived at an angle of about 60 de-grees. Miss Quimby succeeded in partially righting it before site, too, was flung out. The machine glided secone size, too, was nung out. The machine graded down at the surgice of not more than 30 degrees, attract the wester, and turned over. The mechanic examined the wrest of the machine almost immediately, and found everything intact shout the controls. He exists that there, was no founding of the sudder when by the control past, that indeed, this was an impossibility control hosts that indeed, this was an impossibility beapen than was a clearinger of at least four inches blacens the east of the post and the redder wires when the plant year increase as from a possible to the right or its file. Set. S. in 468-set; to rectangle the mechanics of the plant year that the of the Origino. Hence, we present the plant of the control of the plant of the plant year.

of the accident will probably never be known. The mechanic's explanation of how the accident happened starts with the loss of the passenger, who, he believes, me ill and have stood up in an endeavor may have beco may nave become in and nave scood up in an enceavor to signal to Miss Quimby to descend. It is possible that the machine was skidding sideways slightly and that Willard fell over the side. The mechanic did not see just how he fell, but saw everything that happened afterward. Miss Quimby's arms were broken and her chest crushed in, evidently from her being thrown forward with great violence on the curved hood when the machine made a sudden dive. Consequently, she could not right the machine, even if it were possible when once the passenger was gone. Miss Quimby had never experienced any difficulty in controlling her powerful Biëriot. That she could manage it perfectly was shown by the fact that she slighted and started on a strip of ground only 100 feet wide during her flights at Boston. From all this it would appear that the machine had a fatal defect in becoming unbalanced as soon as the passenger was thrown out. senger or pilot, however, it seems to have been perfectly balanced and to have glided safely to earth Entros. ]

# Mississippi River Levees

To the Editor of the SCIENTIFIC AMERICAN:
The levees or dikes of the Mississippi River continue

ing way, thus proving by practical demonstration the titlity of the earthen dike system now in vogue along its banks for protection against overflow. The Govern-ment as well as individuals has sustained irreparable loss this seems from the innumerable crevasees caused by the record-breaking flood height. It would be a conserva-tive estimate to place the value of the standing levees along the Mississippi at \$50,000,000. This is for levees now standing that have successfully weathered this season's flood, it would not include millions of dollars spent in years gone by for levees washed away, fallen in

in your guise by not revese wanted away, fallen in, etc. There is now a strong movement on foot by the different States, petitioning Congress to take over to Government oare the building and maintenance of these dikes. No doubt Congress will do the right thing particularly as it is in line with the administration policy

By way of economy to conserve the fifty million dollars of dikes now standing, it would not be a bad idea to sheet of diles now standing, it would not be a bad idea to sheet pile directly through the center of the crown. Tongue and groove piling such as "Sewall" or "Wakefold" would answer admirably, particularly if the timber was cros-soted, thus insuring an unlimited life; this would present a powerful barrier and he absolute proof against the ravages of musicrats, oray-fish and ting-faishers. The piles should extend from the top of the lews down into piles should extend from the top of the levee down mothe original ground fully 10 feet. In localities where oppress timber is obtainable, the piles could be made of that wood which would last indefinitely underground. that wood which would last indeministy underground, without treatment, and be a saving of nearly 50 per cent over creosoted timber. This work, using cypress, ought not to cost more than \$5 per foot, in place.

New Orleans, Ls.

C. Julian Bartlett, C. E.

# Successive Passages of the Sun Through the Equinox

To the Editor of the Scientific American:
To the inquiry of Mr. John Ford, appearing in your issue of May 25th, I have to say that in the issue of

March 2nd, the interval between successive passages of the sun through the equinox (365 days, 5 hours, 48 minutes, and 46 seconds, according to Mr. Fox) is given as 365 days, 5 hours, and 49 minutes, and that is given as 265 days, 5 hours, and 40 minutes, and that my figuring was done accordingly, but I failed to take into consideration that a leap year is added every 400 years. Further, in figuring out the editor's answer, I discovered that my statement, "at the end of each century we are still about 344 minutes," about have been 354 minutes (1,460 less 1,056) an error which was probably overlooked both by the editor and Mr. Ford. After going over Mr. Ford's figures I find them correct, and thank him for having called my attention to the subject.

Mayagues. Porto Rico.

# A Card Trick

To the Editor of the SCIENTIFIC AMERICAN:

To the follow of the SCIENTIFIC AMERICAN:
The following card trick was explained to me during a
recent railroad journey, and I was told that so far as the
party knew, it had not been published. It is called the
"Hawaiian lalanda," and the little story was told as the
cards were laid out in playing the trick. The story ran

cards were tast out in pusying the error. In a word amountaing like this:

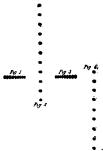
There were four islands in the ses (and the four aces were laid out for the islands) and on those islands there were and out for the mands) and on these slands there were dismends (four diamonds being placed one on each ace) and featr kings want to get the diamonds on these islands (puttling the four kings on the four diamonds) and see kings had nothing to dig with but spades (four ades being laid out, one on each pile) and four pirates ant to reb the kings of the diamonds (the four jacks being

laid out on the piles) and these pirates had no a into out on the pices) and these pirates had no weapons but clubs (four clubs being placed out on the piles) and four queens went to save their kings from the pirates (the four queens being placed one on each pile) and these four queens had nothing to take with them but their hearts (four hearts being laid one on each pile). When the oards are so laid out we have four piles beginning with an ace below and including each an ace, a diamond, a king, a spade, a jack, a club, a queen, and a heart. Now place these four piles one upon another into a single pile or pack. This pack may now be cut, by a square cut, no double cuts allowed, and it may be cut as many times as desired by the party to whom the trick is being exhibited. Then after the party has cut as many times as desired, take the pack and put the cards out in eight piles, taking them in order and going back to the first pile from the end of in order and going back to the may be riven the early the the eight in regular order through the eight piles, and it will be found that all four acce will be in one of the eight piles, all four kings in another, all four queens in another, and so on throughout the series of eight. It may add to and so on throughout the series of eight. It may and to the interest of the trick for the party playing it to inast on the right of making at least two outs after the other party has cut to his heart's desire. The trick is abso-lutely certain in its results when properly played, and it makes no difference whether the party cuts once or a thousand times, if the cut is always a square cut. He may cut deep or shallow as he pleases, and the result is not changed. REGULAR READER.

# Where Do the Secondary Images Come From 2

To the Editor of the Scientific American.

I have observed that when light from a bright source, for example, an electric light, falls on a plate glass mirr at a very large angle of incidence—as near as possible to 90 degree—a number of images become visible in the mirror. At first I supposed this was due to multiple



Variations produced by rotating the glass.

ction from the two faces of the glass, but I have diffioulty in accounting for the different positions of the images. If the glass is kept in the same position but images. If the glass is kept in the same position but rotated shout an axis perpendicular to the glane of the mirror, the brightest image, which is the second one in the series if a silvered mirror is used, seems to remain in about the same position, but the secondary images move around the bright one.

around the bright one.

When the glass is held in one position, the images appear as in Fig. 1. When the glass is rotated through 90 degrees, the images move to the positions shown in Fig. 2. Another 90 degree rotation gives Fig. 3, and so on, In Figs. 2 and 4 the secondary images appear to be about as far from the eye as the primary, but in Figs. 1 and 3 I believe they are unequally distant from the eye, although it was very difficult for me to determine whether the primary or secondary images were the nearer. I thought that perhaps in Fig 1 the secondary images were nearer and in Fig. 3 they were farther from the eye than the primary, or sice sersa. If this is true, it would indicate that the secondary images were rotating in a circle or ellipse the plane of which is nearly perpendicular to the plane of the mirror but oblique to the reflected ray along which, of course, the eye is looking.

The light giving the secondary images after the first three or four is plane polarized, as was shown by examining it with a Nicol prism. I suppose this might be so-counted for by the several reflections which it has undergone, but why should the secondary images change their location while the mirror merely rotates in its own plane?

It occurred to me that the glass might be double sting and the secondary images due to the extraordimary ray, but this does not seem very clear to me. If this is the true explanation, the question at once comes up as to what becomes of the ordinary ray. The plane of polarization does not rotate as the secondary images eve around the primary.

Emporia, Kang

W. B. Laws.





# Recent Excavations at Samaria

Discovery of the Palace of Ahab

Herod's Buildings Unearthed and Ancient Jewish Inscriptions Found

By Harold J. Shepstone



O'NE of the most interesting and valuable discoveries so far recorded in the field of Biblical archeology

has been the recent unearthing at Samarla, in Northern Palestine, of the palace of a Hebrew king, believed to be the "ivory house" of Ahab. Labels with Hebrew the life time and perhaps in the households of Omri and Ahab, have also been found, as well as many frag-ments of pottery. Many Biblical names appear in the writings, such as Elisha, Asa, Nathan, Uzza, Sheba,

Samaria was the ancient capital of the Northern Kingdom of Israel. When Solomon died, about 930 B.C., his kingdom broke into its two natural hereditary N., are an end of which are the control of the control of divisions, Israel and Judah. Sheehom, the first capital of larael, lying in a marrow valley and therefore difficult to defend, was abandoned for Firsah This in its turn, about \$75, was given up for a new site. Ourst, founder of the third dynasty of Israel, chose for his capital an isolated hill some six miles northwest of Shechen. The city which he built here he called Shoneron, now best known by the later Greek form

Shotheron, now need anown up the later types to the name, Samaria

The hill rises to a height of 400 to 500 feet shore
the valleys which surround it. From the summit, some
1,400 feet above sea-level, one may see the Mediterranean, on clear days, some twenty miles to the west. There are also fine views into higher mountains on the north and east, and over the hills and valleys south and west. The naturally steep sides of the bill were easily rendered impregnable by massive walls. The odian city, occupying the top of the hill, was about two and a quarter miles in circumference, and the city Omri was perhaps not much smaller The Herodian wall can still be easily traced. There is no fountain on the bill, and the people of the city must have been dependent on a spring across the valley and or rain-water stored in claseras, of which a great many have been recently unserthed. The bill and the country around are fertile, producing good crops of olives and figs. grain and onlone, and in antiquity, grapes also For agricultural purposes the hill and those about it have been heavily terraced, a work which has greatly disturbed and confused the ancient débris.

distursed and commons are necessary useries. Samaria remained the capital of Israel till taken by the Assyrians in 722 Here Ahab, under Jezebel's influence, built a temple to Bual, later destroyed by Jehn, and here it seems he built also his "ivory house" or palace, described in the First Book of Kings Then it was in Samaria that Elisha had his home. The city underwent many vicissitudes while under Assyrian and Babylonian rule It reached its highest artistic giory, however, under Herod the Great, who rebuilt it in great splendor and named it Sebaste or Sebustych (Latin, Augusta) in honor of his imperial patron, Augustus. Augusta) in some of his imperial patron, Augustus.

Rebustych is still the name of the vilinge on the eastern slope of the hill. Herod fortified the place, and built a great tample here in honor of Augustus.

This, briefly, is the listory of the site of the recent

THE OFFICE AND ASSESSED TO THE SHE OF THE PROPERTY OF THE BEST OF THE SHE OF their digging in sections, the earth from each fresh section uncovered being used to bury again that already laid have after it was minutely examined and fully and accurately planned. Hence it follows that of the very extensive work of uncovering done, first under the dire Prof. Lyon of Harvard, and later und Dr Reisner, well known in connection with similar work in Egypt, only comparatively limited portions can now be shown by photographs.

The most extensive and the most interesting work done was that on the summit of the hill. Here some

times as many as four hundred men, women and boys. including gangs of experienced workers from Egypt, were employed at one time, and here, by long continued and indefatigable toil, the rubbish of successive generations, civilizations and conquests was removed, for depth of many feet, until the bed rock was reach which disclosed, almost without a doubt, the extensive palace of Omri and Ahab, covering an area of nearly two acres. The lower courses of the masonry which came in contact with the rock showed the same pecu liarity as was discovered when, nearly a generation ago, the wall of the Temple inclosure in Jerusalem was laid bare to its foundations, eighty feet below the pres-ent surface. The first course of stone in the temple was embedded in the living rock, in such a way that that layer had rock on all three sides of it, which seems a distinctively Jewish feature. It was at this level in the excavations at Samaria that an alabaster vase, with the Egyptian inscription of their contemporary king, Osorkon II., was found, confirming the assumption that this was the palace of the Jewish kings.

Here it may be noted that this is the first and only since of a Hebrew king ever found, and accordingly is unique and of the deepest interest to archeologists and Biblical scholars. It was undoubtedly an tamense building, consisting of chambers grouped around courts. Here and there stand portions of the finished wall to a height of several courses of stone Moreover, two grades of construction appear, a coarser and a fin The explorers suggest that we have here the pala

of Omri enlarged in a superior style by his son Ahab. There were also discovered here some seventy-five fragments of pottery inscribed with records or mem-oranda in the sacient Hebrew script. This is not the comparatively modern square Hebrew character with which most persons are familiar, but that ancient writing, closely allied to the Phoenician, which is found on the Moabite Stone and the Siloam Tunnel Inscription The character of these inscriptions has settled one disputed point about that of the Siloam. It shows could easily have been written in the time of Riezekiah, as it purports to be, for here is writing of the same type used at Samaria more than a century and a half earlier, for Ahab lived in 896 B C. and Hezekiah These inscriptions are written in ink with a reed pen, in a flowing hand, proving that this was the common form of writing at that period. The words are evenly divided from one another by dots or strokes making it much easier to decipher them. It is e that the inscriptions were written upon jars of wine and oil, and even a date is added, evidently the year of the king's reign. The owner's name is given, as well as the person or place whence the oil on wine came. Here are some of the inscriptions, proving how exact

ancient scribes were in their methods; "In the tenth year. For (or belonging to) Shemaryo. From the Tell. A jar of fine oil.
"In the ninth year. From Shaphtan. For Be'alzamar.

A tur of old wine

in the eleventh year. From Shemids For Heles

Aphsah, Baala (and) Zeker.

"In the tanth year. Wine of the vineyard of the
Tell With a jar of fine oil."

These jars were evidently stored for their owner but where no owner is mentioned the wine probably belongs to the king's palace. It will be noticed that in some of the inscriptions the "Tell" er "Vineyard of the Tell" is mentioned. It is evident that this vineyard must have been one that was especially well knews.

No vineyard in all history was so well known as the
"Vineyard of Naboth," and it gained its fame in the reign of King Abab.

The excavations on the summit showed four aposed eras of structures—Jewish, Rabylonian, -Jewish, Babylonian, Greek, and Rerodian or Roman—in one case, as it were, p

serving within the inclosure of the larger building of later date the core of the older edifices. Of the Roman remains found the most imposing was the 80-foot wide staircase leading down to an altar and probable temple, out up in honor of the Emperor Augustus, where was also found the huge marble trunk of a Roman statue, lying headless and without arms or limbs, which was in all probability that of Cesar. The crate containing this relic can be seen in one of our photographs at the foot of the great staircase

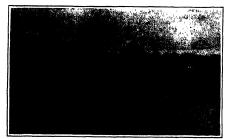
sides the remains just mentioned found on the summit of the hill there was uncovered on the east side of the hill, near the native village of Sebustyeh, the large Roman basilica, the largest and most perfect of the buildings unearthed here, with its tribune, in semi-circular form, still intact, into which later Arab masonry was fitted, and below which earlier remains of places of worship could be inspected. Some work was also done in the triple colonnade, scores of whose mono lith columns are seen, some erect and some prone, as all without their capitals, along the brow of the hill. which colounade led from the tower-flanked western gate of the city to the forum and basilics on the east. Beside this the city wall was traced all sound the Alli, showing that it was a larger city than the present Jerusalem within the walls.

The work around the city gate on the west proved particularly interesting, for this gate has generally been particularly interesting, for this gate has generally need connected with the story of the lepers at the time of the three years' slege by the Syriens, who, on going to the camp of the enemy rather than starve before the city gate, found it descrited, and bringing the news to the famished inhabitants, brought about the fulfilment of the saying of the man of God that on the morrow a measure of fine flour should be sold for a shekel and two measures of bariey for a shekel, and that though the dishelieving officer of the king should see it, yet should be not taste of it it transpiring that he saudin he not taste of it, it transpiring that he was trodden under the feet of the eager and hungry citizens surging through the gate. Here Roman, Greek and Hebrew remins were found superimposed one on the other, betraying, among much else, this peculiarity, that eas the towers were constructed so that the ast by north to the royal palace, yet when the Ron reared their magnificent colonnade, the angle of the gate was altered, being turned to the south so as to lead through their new covered street, lined with stately columns, to the Roman tribunal.

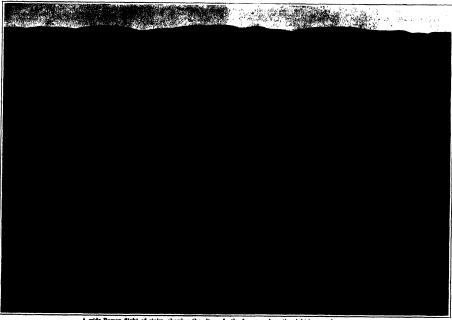
It is Dr. Reisner's intention to resume the work of It is Dr. Reinner's intention to resume the work of accuration during the coming aummer. Only a small portion of the mound has so far been explored, it is thought by assay their here may be indied writinglied decuments satisfied of the little and, history of the early Jewish sings. Then't it must not be "ferrotom that the age of Aliab is only a feetury away from their of Barrill. The division of the land of Palestine into two kingdoms—one with Jerusalem as the capital and the other with Samaria as the capital—occurred only fifty-six years before the time of Ahab. Solomon and all his forcies were still fresh in the, assentory of those still alive, and any part of the ligarature of this important period may be discovered when the rest of the mound of Samaria is excayated. That there are escatishly some documents on clay, if not on papprass, is indiperiod may be discovered when the rest of the mounts of Sanarta is exchayted. That there are certainly abone documents on clay, if not on papyrus, is indicated by the finding of a piece of the clay sevelope or an Assyrian letter, with a part of the name of the max to whom it was addressed still there. The finding of with a freignment like this indicates the great make the probabilities that it is the accurate of the control of the contro ing of even a fragment like this indicates the great probability that in the mound may be a great mass of these lesses, in fact, all the records of the Northern Eingdown of Ternal, for the Amyrian language was used it that time in correspondints between Palastine use. Egypti, as has been proved by the Tel-el-America let-ters discovered in Egypt a few years ago, Such iss-ters would parallel the Biblical marrative.



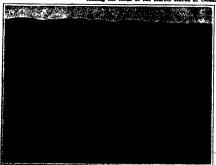
Bow of success columns of the Herodian columnade among the ruins of Samaria.



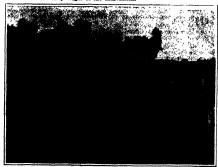
Circular towers, with older square base, which flanked the gate of ancient Samaria.



A wide Roman flight of stairs, showing the altar. In the foreground on the right is a wooden crate, containing the torse of the marble statue of Conar which was found in the early stages of the excavations.



Semerica rules viewed from



The excavated Roman basilica. On the extreme right is seen the semicircular tribune.

# Handcuff Releases Under Difficulties

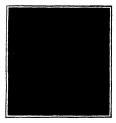
# The Remarkable Feats of Harry Houdini

AMOM the well known vaudeville on Alexanians must be mentloued Mr airs II utility whose colorized featight him knows seek to confine the limit of the strain the strain to the strain and fract us are well known. The public always seems to be interested in secting the other fellow get away from a tight place is that it is little wonder that Houdin's mulleness are always incre Our attution has recently been attracted to a number of feets which was the seen performing in New 2007 and make been performing in New 2007 and the place of the a number best feet, which we will make the property of the a number best feets which we will make the set of the a number best feets which we will make even the set of the a number best frets which we will make even the set of the

On Studies July 7th Mt Houdini in vited a party of newspaper tax in and those interested in integric to sittness a very remarkable lox trick on New York Bay This event was scheduled to take place at a pler on the Bast River but owing to police interference the sex in of operations was transferred to the deck of a large lighter while has towed to the dock of the Quartermasters Department at Governor s Island As this was I cheral property the police could not interfere with this set?

A large wooden box 40 inches long 22 inches wide and 24 inches high was pro-vided. This box was carefully examined and no indication of panels bolts or springs was detected. After divesting himself of his outer clothing and after a committee had seen that he did not have any concealed keen or devices for pick ing the locks of the handcuffs he sub mitted cheerfully to be manacled with leg irons two pairs of handcuffs and ellow irons Any of the spectators had the privilege of bringing their own handcuffs if they so desired as Houdini does not care about furnishing articles of this kind when he is making his more important tests. The cover of the box was removed and floudini crouched in it in a stooped position somewhat resembling the doub-ling up of a jack knife. The cover ling up of a jack knife. The cover was then natled in place with thirty six was then inside in place with thirty are wire nails and the entire lox was banded with band iron or as it is technically known packed for export. On each side a length of iron sewer pipe was secured and iron sash weights were introduced into the pipe thus affording a convenient method of weighing down the box so as to cause it to sink to the level of the water. Two hundred pounds of it m was Holes had been bored in it to per mit the entrance of the water so that the box itself could be readily submerged The box was then carefully roped so that no escape from it could have been posstble had the natis and band from been non-existent or have given away Some non-existent or have given away Some of the planks from the lighter were removed and the box was shoved out on them and was finally dumped in the wa ter In exactly a minute and ten seconds Houdini emerged from the water swim ming toward the lifeboat which had been ming toward the irreboat which had been provided. The act was witnessed by thou sands of spectators who crowded the decks of three ferryboats. The box was hauled onto the deck with the aid of one of the spars of the lighter and the box was carefully examined Nothing was found in it except the uscless manacles which had failed to bind Hondini under which had failed to bind Houdini under the most adverse conditions. Considering the danger of this feat and the entire absence of any panishermalia such as traps etc. It appears to be all the more wonderful. This may be regarded as one of the most remarkable tricks ever per-formed and it is only regrettable that a feat of this magnitude cannot be tried ore a larger gathering of spectators

Houdin's box tricks, his milk can trick and similar entertaining feats will not appeal to the average person as much as his bridge gives which have taken place

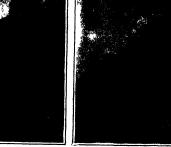


Houdin: injured after an Australian dive.



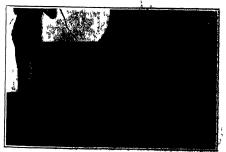
Preparing for the manacled plunge.





Houdini manacled preparing to enter the box.





. The aquatic prison hon.—Nathing up the case with the nid of band fron, Hondini inside.
THE DARING PEATS OF HARRY HOUDEN

Late a person before he is drowned.

A third photocraph shows the position of Moudin's body in his famous jump from the Queen's Bridge, Melbourne, Australia, in March, 1910 His hands were heavily ironed behind his back with hand cuffs and he succeeded in reaching the surface in a surprisingly short space of time in this case he was under water about two minutes. A grueeome incident occurred at the time of this dive The shock of Mr Houdini striking the water was great enough to bring to the surface the body of a man who had been drowned some days before, thus naturally adding greatly to the excitement.

We do not pretend to give any explans

We do not pretend to give any explanation of Roudin's performances. We cau only say that he states that most of the public esposés of tricks of this kind are absolutely worthless, as they would not work in practice under the severe conditions of a committee of examination. Possibly some of our readers have original solutions of these mysteries if we, we should be pleased to hear from them

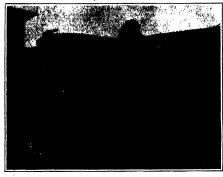
# The Current Supplement

This manufacture of fael briquettes in this country is a growing and import and that the country is a growing and import and that the country is one significant statistics on this satistic are the control of the country in the coun

# Copper Mines in Nova Zembia

EMBISPECTING for beinerals in the Arctic and Antarctic pagions is one of the Interesting desymptomics of recent respective. The interesting desymptomics of recent respective. The interest aircu under this head for that relative despoints of copper lating the interest in Novel Zenathi. Franch size working there despoints below, been all recent in the contract of the interest of th





The sectional firebox boiler intest after the test

Bomb-proof" from which boilers were operated and observed. Note telescope.

# Blowing Up a Locomotive Boiler

# Test of a New Type of Safety Boiler

The statistics gathered by the State Railroad Commission show that every year an average of fifty locomotive boilers explode, causing a damage to property of several millions of dollars and the loss of more reless than one hundred lives, to say nothing of in juries to a larger number of people. The careful investigations which are carried out under the Commission usually by here the defects or mismanagement

which led to the disasters: but in many cases it is difficult, and indeed impossible, to determine the cause. Low water in the boiler, due to carelessness or oversight on the part of the fireman, accounts for a large number of explosions. Should the water level fill to such a point that the crown, or roof as it might be called, of the firehox is uncovered, the great heat of the fire raises the temperature to a point at which the metal losse its strength and yields under the steam pressure, tearing losse from the statphots which normally hold it in position.

In the standard type of locomotive, the firebox is held to shape against the inward pressure by tying it to the outer shell of the boller with a large number of stayboits. Under normal conditions this construction is sufficient for its purpose. It we should the crown of the firebox become overheated through the water falling below its surface and exposing it to the full best of the fire, the beads of the stayboits and the holes in the crown, softened by the heat, are no longer able to hold against the pressure. The bolta are pulled through, and the crown is

crushed in. Of all the causes which lead to builter asphesison, this is probably the most frequent. A mong the many attempts to build a boiler which would be poor against this form of accident, the most successful is that known as the Jacobe-Shupert sectional firebox, which was not a several years ago in the mechanical department of the Santa Fe Ballroad Company from the bolian of the two entirests whose names if there.



The explosion of the radial-stay firebox boiler.

number of these fireboxes have been built and australia in the service on the Santa Fe and other railroads, wherever the hard Fe and other railroads, wherever the part of the

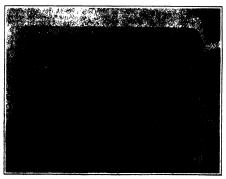
to make a test on a hitherto unprecedented scale, to determine how far it was proof against explosion due to low water, and at the same time to determine whether low water was a sure cause of explosion when it occurred on bollers of the standard radial-stay time.

The demonstration was made at Vautevilic, Pa., on June 20th of this year, hefore a large gathering composed chiefly of
ongineers representing various departments of encineering. Two full-size locumotive boilers, designed for high
speed heavy passenger service, were
each subjected to severe low-water
tests. Both boilers were identical in
size and design except that one
had a Jacobs-Shupert sectional firebox, while the other had an ordinary
radial-stay firehox. In carrying out the
test, both boilers were mounted in a fled,
fifty feet apart, and they were operated
from a "homi-proof" located two hundred feet away from the nearest boiler. Hecause of the danger to which
a fireman shoveling coal would have
been existed, oil was used for fuel. Grad-

(Concluded on page 66.)







Crown of the radiabatay furnace, bulged in

# Rubber Natural and Synthetic

# How Will Artificial Rubber Affect the Plantation?

By Prof. F. Willy Hinrichsen, of the Koenigliches Material-Pruefungsamt, Berlin

I N the last few years the world's consumption of caout-chouch as increased at an extraordinary rate, indeed, so extraordinary, that the supply has not been able to keep up with the demand. The following table statistically marizes this remarkable increase

World Production and World Consumption of Caoutchous

Years.	World Production in Tone.	World Consumption in Tons		
1899-1900	53,348	48,352		
1900-1901	52,864	51,136		
1901-1902	53,887	51,110		
1902-1903	55,603	55,276		
1903-1904	61,759	59,666		
1904-1905	68,879	65,083		
1905-1906	67,999	62,754		
1906-1907	74.023	68,173		
1907-1908	66,379	62,376		
1908-1909	70.587	71.998		
1909-1910	76.553	76.026		
1910-1911	79,305	74,082		

From this table it appears that the consumption of rubber in the year 1908-1909 (the financial year being usually reckoned from July 1st to the following June South) exceeded the production. Had it not been for large reserves of raw caoutchous left over from previous years, the commercial situation might have been alarm-

## The Price of Raw Rubber.

This unfavorable relation between production and consumption naturally resulted in a considerable rise in the market price of rubber. The increase in price which would have normally resulted would have been serious enough, but thanks to the stock jobber, rubber brought 12 shillings 6 pence per pound in May, 1910. After that there was a drop. In June, 1911, the price of raw caout-chouc reached a minimum of less than 4 shillings. Then came another increase. The prices that I have here quoted are those for the best quality of Brazilian Para

The payment of such fabulous sums for nature stimulated efforts to produce rubber artificially, in suffi-cient quantities and at sufficiently low prices to compete with Para gum. I take it that readers of the SCIENTIFIC are more or less familiar with the methods oyed in obtaining natural rubber Caoutchoue is employed in obtaining natural ribber Caoutonouc is found in the milky juice (latex) of certain plants, which flows out when the bark is pierced By proper treatment this milk is converted into caoutchouc. In separating or coagulating esoutchoug the action of heat or chemicals is most important

# Rubber Plantations

Because the production of natural gum is not sufficient to keep pace with the constantly increasing demand, the more so since whole trees are felled and other most ruthless methods are resorted to, caoutchouc producers for some years past carried on the cultivation of the rubtree on plantations. Their rubber may even now be sidered the most promising competitor of the wild tree. Enormous areas, especially in Asia (the Malay States, Ceylon, etc.), have been planted with caoutchouc trees. The growth of these trees is rapid, and the amount of caoutehous annually produced by plantations is constantly increasing. By careful study the most favorable conditions for cultivation—especially the conditions of soil and the most convenient method of coagu--have been ascertained. In fact, plantai eacutchouc is even now almost as good as Brazilian Pars gum It has brought prices just as high.

More interesting, sensationally so, in fact, is the production of rubber by artificial means, rubber which in its chemical and physical properties is exactly the same as

# How Rubber is Made in the Laboratory.

Caoutchoue proper is a compound of carbon and hydrogen, a compound in which these two elements bear the same relation to each other as in a certain well-known class of bodies called terpenes, the main constituents of ethereal oils. From these terpenes some well-known aromatic substances are derived among others. In order to ascertain the manner in which atoms of bon and hydrogen are fixed in caoutchouc, the cher must first decompose the escutchoue, split it up, in other words. If he can do this completely he can obviously dis-sover exactly what alements are required to chouc. When that mystery is revealed his next task is to take the elements of which caoutchouc is composed and to combine them in the proper way in order to

[The author of this article, Prof. Hinrichsen, has leted for the Koenigliches Material-Pruefungsamt what may well be regarded as a most thorough study of natural rubber, artificial rubber and rub ber substitutes. For that reason his comments on the commercial possibilities of the synthetic rubber discovered in Germany deserve more than passing attention. An entirely new significance and interest has been added to the topic by the recent authoritative announcement that a body of English chemists have surmounted the last difulties in the synthesis of rubber, and have placed it upon what promises to be a sound comm to upon what promotes to be about commercial bads. Prof. Hinrichen's article was written be-fore this announcement, and is published here in its original form. The reader must supplement his information by reference to our editorial page. -EDITOR. 1

ducs artificially a rubber which is chemically the same produce artificially a full of which is chemically the same as the substance obtained from the Hevea tree. Stated thus baldly the problem seems very simple. Yet more than a decade of arduous chemical research has been required before rubber was synthetically produced in the laboratory

Among the constituents of rubber which are split up by intense heat is a liquid which boils at a low tempera-ture and which in odor and in boiling point closely resem-bles ordinary ether. That substance is known as isond was discovered by Williams as far back Indeed, isoprene proved to be a compound of carbon and hydrogen in about the same prop they are found in rubber itself.

Bouchardat, in the course of a comprehensive investigation, found that isoprene, unde converted into a substance analogous to caoutchouc. Other experimenters made the same observation later, among them Tilden and Wallach. Frequently, however, the conversion failed to take place. Why? Because the exact experimental conditions which governed the conversion of isoprene into caoutchouc had not yet been asversion of hoperate into capterious and not yet been as-certained. The failures were so numerous that chemists began to doubt the correctness of earlier observations. It was not before 1909, when F. Hofmann and C. Coutelle, two chemists in the employ of one of the largest chemical works in Germany, found that absolutely pure isoprene is converted into a substance resembling caout-chouc if heated under pressure with and without the intervention of other substances. Independently of these experimenters, C. Harries, at Kiel, discovered the reaction while heating isoprene with acetic acid.

# The Commercial Possibilities of Artificial Rubi

These experiments have solved the problem of producing rubber synthetically, but as yet only from a scientific point of view. It may here be added that if the initial material be varied in quality and the experimental conditions modified, a number of substances which recaoutchouc can be obtained, which are not to be found in nature.

Naturally the business man asks: What is the protical value of this work? Is synthetic rubber merely a

tical value of this work? Is synthetic rubber merely a laboratory unitedly? Or, on it be produced in marketable quantities at a price to compete with Para gam? If artificial rubber is to take the place of Spenstural produce, it must be produced more cheaply shan Para gum and it must bossess all the really seasonist properties of Para gum. Whether or not artificial rubber on compete with natural rubber depends on so many sommercial conditions, it is hard to give a definite answer. Some day it will compate; that much is certain. When that day will dawn, is decidedly unsertain. The struggle is bound to be a hard one. The price of Para gum vill surely drop as the acoutchous plantations are extended and as their annual production increases. and as their annual production increases. The cost of producing a pound of first-class Asiatic plantation rubber is somewhat less than 25 cents. It is possible that even is somewhat less than 20 cents. It is possible that even if it costs more to produce artificial than natural rubber, the new laboratory product may have a commercial future if it proves superior in important respects to the natural product.

On the whole, it is not likely that artificial rubber will On the whole, it is not likely that arturous runbes wis entirely displace natural and plantation gum, as the coal tar dyes have displaced vegetable dyes. In all probabil-ity the natural and ertificial justudes will be seld side by side in the market much as matural and artificial silk are

The manufacturing cost of artificial rubber de primarily upon the cost of the raw material from it is made, isoprene or related hydrocarbons. Pa

have recently been taken out to cover per to reduce the cost of the raw material. to reduce the cost of the raw material. Isopreme, itself, is obtained not simply from heated caoutchous but also from turpentine oil and from certain components of coal tar (cresol). Naturally, for practical purposes the iso-prene must be obtained from some other source that

The state of the s

Long before artificial rubber was successfully produ Long before artificial rubber was successfully produced various compounds had been discovered which had many of the properties of rubber, but were chemically different from it. Many of these are compounds of oil, shellac and similar substances. Such rubber substitutes, "facand ammer successions. Such rubber substitute, is tices," the French call them, are obtained by treati oils with sulphur chloride, in which case a white rubbe like substance is obtained; or with sulphur alon which case a brown imitation rubber is produced. tures of such oil, or sulphur compounds with caoutchout have proved convenient and serviceable. They seem to last longer than rubber. The imitations or factions last longer than rubber. The imitations or naviness themselves, depending upon their process of manufac-ture, are usually loose and brittle masses of a white or brown color, to be distinguished from rubber by their ready saponification; in other words, they are easily

ready asponmenton; in other word, they are easily attacked by lye plastic masses made from glue, gelatins, cellulose and the like—all alleged to be perfect substi-tutes for rubber. Some of these have proved of indus-trial importance. Most of them are valueless because of their inferior elasticity.

## Regenerated Rubber.

Foremost among the substitutes for pure rubber may be mentioned regenerated rubber obtained from refuse articles of manufactured rubber. Because of the small supply of natural caoutchoue, the necessity of utilizing the refuse of rubber factories had become almost pressing. ording to authoritative estimates, the quantity of old rubber regenerated for the manufacture of rubber articles surpasses the consumption of raw eacutchouc. Such reclaimed rubber is no perfect substitute for new gum. It has lost much of elasticity and strength by the mechannas loss much of enabelly an averagen by the meaning-ical, physical and chemical processes to which it is sub-jected. Old rubber shoes, pneumatic tires and the like constitute the raw material from which regenerated rub-ber is made. When reclaimed the rubber differs in a marked degree from eaoutchouc.

e knows at this late day that all rubber arti-e vulcanized, in other words, that at certain ss must be vulo temperatures sulphur in some form must be added.

Although the actual chemical process that occurs when sulphur is thus added is not yet known with absolute certainty, recent investigations show that part of the sul-phur compounds are chemically fixed by the caoutchoue. This "combined" sulphur, as it is called, is not eliminated from present regenerated material. In actual practies, the reclaiming or regenerating process destroys the fabrics in the old rubber and converts the remaining vul-canised rubber to a plastic form for further manipulation.

There is no good reason why the sulphur combined th vulcanized rubber could not be removed, theoretically, at least. Most rubber experts, however, have come to

conclusion that the task is hopeless.

cmc apprehension has been expressed lest the continual increase in the production of plantation rubber should result in an over-production. Such apprehensions are diese. Even if the plantations should continue to produce rubber at the present rate, and even if synthetic rubber should also be manufactured, the demand for the runous mount aim on manuractured, the demand for the natural product will not abute. The quantity of caout-chous which the world seeds is so great that all available sources of supply will be drawn upon. The price, of course, will fall; but that, again, will be offset by ind consumption.

If it were possible for manufacturers to employ synetic rubber, natural rubber and plantation rubber very much lower prices than are at present charged, there wery mean lower prices than are at present charged, there would be no doubt that the world at large would benefit. The possibilities of rubber are far from being exhausted. The high cost of the raw gum has hitherto limited the applications of one of the most useful substances in the world. When the price of rubber does fall, because new sweld. When the price of rubber does fall, because new solvence of supply have been made available, we may pos-sibly speek of a "rubber age." It is not too romantio to insegian how noiseless would be the street trainf of large often speek of the street trainf of large often speek of the street training the street of the street training will be made of rubber, which last possibility is not wildly ex-travagant; insemmel as rubber pavements have already. The state of the s

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

# Cigar-banding by Machine

THERE is usually but one right way of doing a thing as against a large number wrong ways. In few cases, however, of Wrong Wave. does the disparity between right and wrong ways reach such enormous figures as in the

Custom demands that eigers be packed so tightly in the box that they lose their so ugmy in the hot make they consider rounded shape and are fixtened one against the other. This result is obtained by placing the well-filled box in a mechanical press and leaving it under compression ber of hours. At the end of that time each eight is found to possess an in-dividuality of its own. It is unlike any of its fellows. It has yielded here and there to accommodate itself to the crowding and pressing of adjacent cigars. It is of such irregular form that it will not fit in any other position in the box. Obviously, it other position in the box. Orbinally, it would not do to band this eigar before it had assumed its final form, for otherwise the band would not fit snugly, and it would be mussed and crumpled in the press. Therefore, it is necessary to remove the cigars from the box after they have been compressed, and band them separately compressed, and band them separately one by one, replacing them in their original container in the same order as they occupiation of the same order as they occupiation to restore each cigar to its original position, trouble is sure to ensue. Once the order is lost, the chances of rediscovering the original arrangement are hopelessly gainst the operator. Consider a sin against theoperator. Consider a single row of twelve eigars. It is a simple mathema-tical problem. Multiply 1x23, etc. up to 12, and the result will be 479,001,000 different ways in which those twelve eigars may be arranged. If we consider an entire boxful of cigars, the number of wrong ways in which they can be put in the box will reach such a stupendous figure as to pass entirely beyond the comprehension of anyone but an astronomer. Realizing this as well as the fact that objects not uniform in shape are difficult to handle, cigar manu-facturers have declared stoutly that the ng of cigars after having been packed

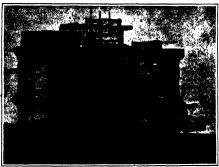
banding of eigars after having been packed could never be accomplished by machine. According to the latest report of the Internal Revenue Department, there are some 25,000 cigar manufacturers in the United States, making about eight billion oigars per year, and it is conservatively estimated that fully six billion of these ar banded. As all this work is now done by hand, this means that there are six billion mand, and means that there are six billion separate hand operations requisite. The work is done by girls at almost incredible speed. Yet the cost of banding runs up into the millions of dollars per annum, and imposes a heavy burden on the cigar indus-A number of years ago a banding machine was invented for banding loose cigara However, as the number of unpacked banded cigars is comparatively small, this machine did very little toward relieving

About a year ago, we described a ma-chine which had just been built for banding packed cigars. While that machine did packed cigars. While that machine did actually band cigars, after they had been actually band cigars, after they had been packed, it was not adaptable to certain special demands of the digar manufacturer. Accordingly, a second design has been developed, which is shown in the accom-

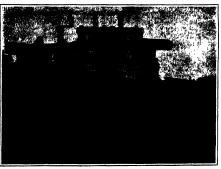
panying illustrations. This machine is so ved and simplified as to appear like an entirely different mechanism. It will take the eigers from a box, band each one separately, place the band in the center, or at any other desired point on the separately, place the band in the center, or at any other desired point on the olgar, re-verse the band for alternate rows, if so desired, and restore all the olgars to the hox, doing the work at the rate of about 90 per minute with a single operator, as against two in the old machine.

placed on a tray without disturbing their operator is slowly retracted, until, by the relative order. The tray is then placed in time the first row has passed through the container shown at the let-hand, side banding mechanism, it will be ready to of one of our photographs, and thence the eject the next row in the tray. The eigers cigars are moved row by row out upon a receiving table. The most conspicuous object in this photograph is a cam with two broad wings. When the cam roller drops off the point of one of the wings to the base of the other, it acts to eject the bottom row cigars from the tray

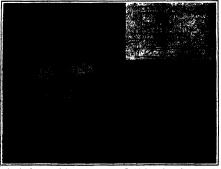
are picked up one by one from the receiving table by a forked suction tube and placed on a pair of fingers or hollow stems s a cam roller drops of rubber, connected with a vacuum pump, cam roller drops of rubber, connected with a vacuum pump, wings to the base is othat they will hold the eigar firmly by the bottom row suction, yet without danger of injuring the Thereupon the wrapper. Before the eigar is carried to the



General view of the cigar-banding machine.



A cigar leaving the banding mechanism, a band being lowered for the next cigar,



rare are removed from the hox and Forcing the cigars out of the tray into the box. Insert shows the banding mechanism.

banding point, a suction finger rises tically and removes a band from the bot-tom of a pile placed directly above the banding point. The cigar is then carried banding point. The eigar is then carried over the band and pressed down with it between a pair of spring-pressed guide-plates shown at A in the line drawing, which fold the paper closely around three sides of the eigar. Thereupon a tucker plate B folds one end of the band down upon the cigar. Above the tucker plate is a gumming device, consisting of a tube terminating in an inclined plate C provided with two small perforations. Through these perforations two beads of gum about the size of a pin-head are squeezed out on the plate and are wiped off upon the other end of the band as it is folded down by means of a rubber-coated roller D. me time the tucker plate and gumming device are withdrawn, the tucker plate serving to shield the eigar-band from gum scraped off the gummed end Above the gumming device is a plate E, which serves as a guard to prevent the band from coming in contact with the gum as it is drawn down into position to receive the cigar. While the cirar is being banded the rubber fingers which carry it to that position return to get another eigar, while a second pair of suction fingers take the banded eigar and carry it over to a delivery table. Thus the process is continued until a comof cigars has been delivered, whereupon a pusher slide moves the entire row endwise into the tray shown in the foreground of the photograph at the right of the machine. After receiving a row, this container moves down to the proper position for the second row and when the enbox of cigars has been handed the cigar box is inverted and placed over the trav It will be noted that the arrangement the cigars in the tray at the delivery end is exactly the same as that at the receiving end. The box and tray are now revolved together so as to bring the box right side up, whereupon the cigars are forced out into the box, as shown in one of the illustrations. The tray is double, so that when it is revolved to discharge one section, a econd section is brought into position, and work of the machine can proceed without interruption

In our enlarged view of a portion of the machine may be seen a small hand crank upon a threaded vertical shaft. This shaft forms the plunger rod that projects from the gum cylinder. A ratchet mechanism is operated to feed the plunger down as each igar comes to the banding position. The amount of gum required for each band is so minute that a reducing gear is required between the ratchet and the plunger. At each operation of the ratchet the plunger is made to move down one ten-thousandth of an meh. The actual amount of gum in each bead on the gum plate is 0.0001 cubic inch. The cylinder is large enough to store a day's supply. To refill the cylinder, the hand crank is operated to withdraw the plunger and thus suck in the gum.

Some dealers prefer to have the bands applied near one end of the eigars instead approximate one end of the eights instead of centrally. To provide for this an end-stop is used for the ejector elide, and by adjusting this stop with respect to the banding point the position of the band upon the eight may be determined. When it is desired to reverse the bands in alter nate rows, a cam connection is made, which nauses the suction finger, as well as the entire banding mechanism, to revolve through an angle of 180 degrees after each hand is removed from the pile, thus revers-ing the position of the band. This reversal will continue for the entire row of cigars, after which the parts will be turned to normal position and there will be no re al while the next row of bands is being It is customary to pack cigars in rows of 12 and 13 alternately, or in rows of 10 each. The mechanism is arranged to accom-modate itself to such packing. The cam shaft which feeds the cigars to the receiving table and controls the feed from the delivery table is moved by a ratchet mechdelivery table is moved by a reactive meanism. Two ratchet wheels are provided, one of which has 13 teeth on one half and 12 on the other, while the second ratchet wheel has the same number of teeth on each half. When the ratchet pawl is thrown into the former ratchet wheel it will feed the shafts at the rate of 13 steps for one the shafts at the rate of 13 steps for one-half revolution, and 12 steps for the other. When, however, the ratchet pawl is thrown into the other wheel, the feed will be uniform. Another adjustment provides for regulating the machine to handle boxes of 25, 50 or 100 cigars A ratchet wheel with 100 teeth is employed, and if there are 100 eigars to the box the pawl engages I tooth at a time, if 50 to the box, 2 teeth at a time; a time, if 30 to the lox, 2 teeth at a time, and if 25 to the box, 4 teeth at a time. The machine can thus be adjusted to prac-tically every requirement of the industry.

# The Trade-mark as a Business As By W. E. Woodward

THE average business man has only the vaguest notion of the value of a trademark. He does not realise that it is very often the connecting link between the projucer and the ultimate consumer, that it is a symbol of good will, a langible asset with a determinable money value, that it must be chosen and applied not in a hapharard way but with a due regard for its psychologi-cal effect upon the public. Nor does he realize the importance of complying with the statutory requirements which secure to him a property right in a trade-mark comparable with the property right that a inventor acquires by taking out a patent.

The follo wing is the second of a series of The following is the second of a series of articles, written by a man who is all once a trade-mark, an advertising, and a busi-ness expert, a man who has a first hand knowledge of the value of trade-mark and of the correct methods of trade-mark exploitaof the correct methods of trade-mark exprom-tion. The series, which will be eventually published in book form, will include dis-cusesons, written in business English, of the Federal trude-mark law, analyses of the requirements for registration, the elements of a good trade-mark, and trade-mark protection .- EDITOR.

# The Federal Trade-mark Law-IL

The function of a trade-mark is to note origin.
Throughout its history the trade-mark

the troughout its interest and the semants has remained true to its ancient antecedents, and its purpose to-day, as it was in the fifteenth century, is specifically to indicate the origin of an article of mer-

In this aspect of unchanging purpose the trade-mark is somewhat an anomaly in commercial history. During the last in commercial inserty.

four hundred years, methods of manufacture, distribution and sale have been revolutionized from top to bottom: banks, which began as more money-changing offices, have become establishments for offices, have become establishments for keeping and loaning funds, the retailer, who used to sit in a hole in the wall with a handful of goods, all of the same kind, has developed into a merchant selling ten thousand different articles, the craftsman, who once served a long apprentice-ship, during which he loarned to make every part of a shoe or a carriage, has become a specialized laborer, employed by the day to produce the extreme sub-division of a finished article.

The reader should understand clearly

that the right to own a trade-mark is not a creation of the statute, for the use of trade-marks, and the recognized right of manufacturers to be protected in the use, far ante-date any specific trade-mark

The intent of the statute is to systematize and codify trade-mark practice It provides a definite procedure for the registration of trade-marks, lays down rules for validity in marks, puts trade-mark litigation, when registered trade-

marks are the subject matter of the litiga marks are the subject matter of the litiga-tion, within the jurisdiction of the Federal courts: and makes every trade-mark republic records of the nation. But a trade-mark may be legally sound even if not registered, just as a person may own real estate without recording the title.

The ownership of trade-marks, like every The ownership of trade-mars, like every other property right, is recognized by the common law. The Supreme Court of the United States has said: "The right to adopt and use a symbol or device to distinguish the goods or property made or sold by the person whose mark it is, to the exclusion of use by all other persons, has been long recognized by the common law and the chancery courts of England and of this country. It is a property right for the violation of which damage may be recovered in an action at law, an the continued violation of it will be enjoined by a court of equity with com-

pensation for past infringements."
Trade-marks, under the Act of 1905, are registered in the United States Patent

In case of litigation resulting over th right to use any trade-mark, evidence of the registration of the mark by one of the litigants puts the burden of proof upon the other. In other words, the user of the unregistered trade-mark must prove priority of use and ownership. This is often a very difficult thing to do, especially in the case of trade-marks that have been used a long time, for such proof maye necessarily rest upon the production of old labels, packages of the goods with the trade-mark affixed, and testimony of witnesses

The owner of a registered trade does not need any evidence other than the public records of the Patent Office to establish the date of his first use of the

When a trado-mark is not registered in the Patent Office, litigation concerning it does not come under the jurisdiction the Federal courts, unless the oppor parties are citizens of different States. opposing

On the other hand, all cases pertaining to registered trade-marks fall within the field of Federal jurisdiction, irrespective of the amount in dispute or the place of residence of the parties. There is an obvious advantage in this, owing to the fact that an injunction secured in one Federal court will be enforced in all such courts in any State.

The fee charged by the Patent Office, under the law, for registering a trade-mark is ten dollars. This does not include the attorney's fee, which must be paid

by the applicant.

A certificate of registration remains in force for twenty years, and it may be renewed upon expiration, for like periods of twenty years, upon payment of a re-newal fee of ten dollars.

An individual or corporation has a right to register a trade-mark under the United States law if the trade-mark for which registration is sought belongs to the applicant and is used by him:

commerce among the several

2. Or, in commerce with foreign nations 3. Ot, in commerce with the Indian ribes.

Provided the owner of the trade-mark condes within the territory of the United States (which includes all territory under the United States control), or has a busi-ness establishment situated in United

ness establishment satuated in United States territory, or resides in any foreign country which affords, by treaty, similar privileges to citzens of the United States. Divested of kgal verbiage, the main provisions of the Act, so far as the fea-tures governing registration are concerned, may be stated as follows:

A trade-mark is not registrable if it is: A trude-mark is not registrates in it is; A design overding identical with a registered or known trade-mark owned and in use by another, and appropriated to morchandles of the same descriptive qualities, or which so nearly resembles a revisitered to known trade-mark compets and used by another and appropriated to merchandles of the rame descriptive qualities, as to fanctive pur-chasers, or to be likely to cause confusion in the mind of the public. The insignia of the Ame

The imaginate or see amount of the forces foodery.
The flag or coat of arress of any for Any design or picture which has I by a fraternal modely as its embles A portrait of a living individual application for registration is soon

Road-dous or immored master of any description.

The flag or cross of arms of the United States, or of any States, or of any municipality, or any of the property of the states, or of any states, or of any states, or of any states, or any of the states, or any of the commonly with which it is used.

Any mark which tronsies metody in the name of the commonly with which it is used.

Any mark which tronsies metody in the ones of the commonly with the property of the commonly of the commonly of the commonly of the common of the commo

A trade-mark is registrable if it is:

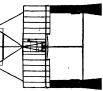
A trade-mark is registrable if it is:
Unlike any other trade-mark already in use, and applied to the name class of goods. It must not resemble to be trade-mark of a competition, the contract of the contract

obviously concrepants of the late of the l

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the Schmitzer.

Pertaining to Aviation.
ARRIPHANE-Louis F Backcort, 36
Port St., Hartford, Com. This invention relate to a novel form of aeroplane, and more particularly to one having automatic stabilising devices occurring thewarth An object is opported means for automatically maintaining or restoring the lateral and longitudinal behave of the acroplane. Further, an object



AEROPLANE.

is to provide an evopiace baving stabilisin surfaces and guiding elements which may be meanually operated to convert the same int additional stabilising elements. The investor has on many occasions proved that transvers and longitudinal estability of bls flying machin sha been automaticilly maintained. The ser-piane is abown in a plan view equipped wit a preferred embodiment of the investica.

resilient, the smaller end of the star extend-ing to, and in part constituting the the of the wing, together with feathers, each having a strum and one or more fine extending from the stem, each fin being of composite strue-

# Electrical Borio

Electrical Bevfeces.

INSULATOR—H. Laron, Eled, and F. Dauccian McLea, provides an lanciator to be used in connection with high-tension configuration of the configuration of the connection of the configuration of the configuration of the configuration of the configuration of the connection of the configuration of the co

DISSOLVING YESW DISSOLT ASPASANCE. C. T. Trickler, Jr., Deep Decima Ave. B. T. B. Trickler, Jr., Deep Decima Ave. B. T. B. Trickler, Jr., Deep Decima Ave. B. T. B. Trickler, Jr., Deep Decimal Ave. B. Trickler, Jr. Trickler, Jr

BURGLER ALAREM—G. De Grovarry, idea Washington Ave. Brenz, N. Y. This improvement relates to bengiar ainmen, the more specificate purpose being to provide an electric airm associated with a united of core of the airm associated with a united of core of the airm associated with a united of core of the airm associated with a united of core of the airm associated with a united of airm of the airm to be actuated.

REARK ARRESTER—B. C. Morizay, ibec 131. Housian, Wash. Mr. Moskley has for the object of his invention the provision of a simple interposarie derice capable of attachment to any study without change in the seaso, of which the unconsumed solid matters special from the stack will be held in the arrester.

Of Riscreek to Farmers.

of wind tes incommone soils matters ejectors from the efact will be held in the arrester.

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## Of General Inte

OF General Interest.

INMOVABLE READ FOR BARRELS AND
LIKE BECEPTACLES.—G. W. Everas, care
of A. W. Massrata, Anahue, Teass. This
bed is particularly adapted for metallic barrels and like receptacies. The body of the
barral is provided interiorly with a fixed ledge
and to which it may be clamped by means of
devices that include a hasp adapted to be
ecured by a padiotk or other device.

DENTAL APPLIANCE.—Da. W. F. Davison, Sil E. Mais S., Hichond, Va. In the
use of this easily applied device, the rubber
be in the ordinary manner. A wedge is then
pressed between the teeth below and in close



DENTAL APPLIANCE

DERTAL APPLIANCE.

proximity to the outer side of the rubber dau until the wedge clamps by its wedging action between the teeth. The inner and the outer each of the wedge are then bent to secure the wedge in place and to hold the dam out of the way. The Illustration herwith presents a front elevation of the invention as in

DEVICE FOR MEARURING DRAPT ANI-MAIS FOR COLLARS.—D. N. BROWN, Water-town, N. T. The object of the present inva-tion is to provide a simple and inexpensive device by mean; of which the exact measure-ment of the arck of the draft animal from the largest to the smallest side, may be obtained. When not in use, the device may be henry us, by engasting the hook with a nail to henry us, by engasting the hook with a nail of the bar.

Norm.—Copies of any of these paints will be furnished by the SCHMTHFIC AMBRICAN for ten cents each. Please state the name of the patentes, title of the invention, and date of this paper.

Wa brish to call attention to the fact that we are Walfish to call attention to the fact that we are in a position to reader compension services in every branch of patents or trade-complete services in every branch of patents or trade-mark work. Our east it component of mechanical, electrical and chemistic experts, thereforefally related to propose and presents at gasteria applications, irrespective of the createst gasteria applications, irrespective of the or of the specialized, benthiesal, or adventish convincing required silapration. We are prepared to render opinions as traditive or infrasquement of potents, or write required to conditions acting in needes-mark and smaller, compensions markets, produced a final final properties the world with seated in the pronounties of patents and syndrometry patents.

Mons De.

d States

MYNN & Co.,

Falont Astorneys,

Sti Breadway,

New York, St. T.

reactic Giffice: 16 F Berest, M. W., Washington, D. C.

# A Hangar Ship By Capt. W. Saving Chambers, U. S. Navy

Fig. 78 seasoned analyseous requests from squadron. The idea is that aeroplanes may lightly spapers and magashoss to supply be used far in advance of the actual fight-design of a "hangar ship" which I am implicate the state of a st may a sevent and to correct a false impres-sion as to my attitude in the matter.

I have never made any such recommen-tion for the reason that I do not believe that we need such a vessel, even if we could get it. If it is not needed a grave error r the proposi

ander the proposition.

My risws on this subject may be found recorded in the Proceedings of the U.S. Naval Institute for June, 1912, page 745, where, in the discussion of the able article on Naval Aviation by Lieut. Lapointe, of he is a value a value of y lieut. Lapounte, or the french navy, I say, "I am quite sure that the majority of our naval officers will agree with this writer on the relative importance of 'capital shipe' and auxiliaries."

up of ships, as many ships as possible for the money available. But I also believe that these ships should be of the type to victory in battle assure victory in battle—battleships— 'capital ships.' Cruisers, scouts, destroy-ers, torpedo boats and submarines are all auxiliary to the battle fleet. Though such auxiliaries are many, their importance must not be exaggerated to the point of spending on vessel mar, or more than barl, of our appropriation, as has recently been done. The navy has suffered from a crase for folilias of uneless and costy auxiliaries of every type, whose only reason for existence is a supposed economy.

"A short time ago the true state of affairs

was realized, and the construction of tor pedo boats and cruisers was discontinued."

And on page 653 he states: "But it is evidently a great advantage to have an onlane stationed on a ship from which it be isunched and upon which it can land. For such a purpose a garage resest has been proposed to accompany the fleet and shelter a half dozen serial scouts. But in order to be of any real value such a ship in order to be of any real value such a ship must be a great vessel with enormous deck space and with a speed equal to that of the fleet. The probable cost of 15,000,000 frames would hardly be justified, even if the number of cruisers were reduced. Besides, number or cruisers were reduced. Besides, such expense is not necessary. Modern battleships of the largest size can easily provide space for the launching and landing of aeroplanes without interference with ing or acropiance without interference with essential features of design or great expense. In addition, an acroplane can easily be taken apart and stowed below if it be desired to keep it aboard during action—this is hardly probable, however, At any rate, the problem of rising from a ship's deck and landing upon it is now being studied by able minds, and we can expect a practical solution at any time."
My opinion of the "garage sease" is registered in the discussion, page 746, as follows: "Burthermore, the use of a garage vassel would add another of the needless auxiliaries, which according to his reasonsired to keep it aboard during action—this is hardly probable, however. At any rate,

auxiliaries, which according to his reason-ing should be augicled."

ing should be amplied.

The ingenious author of the newspaper the ingenious author of the newspaper hoar, referred to primarily, estates that "who first hangar ship shall be of size, ordering in the ship of the

# Growth of the Automobile Industry

This beat way of presenting day statistics in the common method of showing built cather in a form that is both interesting and than numbers. We have therefore shown in a form that is both interesting and than numbers. We have therefore shown in the common representation in the property interesting a single one semigration. Some sides of entermoner representing the entire output for the year. I show that the best in other words, if all the material used in fast year the actionabiles manufactured hast year. If the Whitely Spitche produced 500,000 cars, were put into a single our, he plant product buy the could we possibly show a picture would be 50 times as long, 50 times as high, of the rest analysis of the rest and the res

for the hangar ship."

Other details he gives, but the more they are analyzed, the more it becomes appare that the ideal "hangar ship" is the ideal scout itself. Certainly the scout must have no peer in speed and it would surely be out of the question for one such ship to be of any use in supplying aerial accessories to a dozen or more scouts scattered over an

extensive scouting line. extensive soonting line.

Now it has been my idea from the beginning that all soonts should be supplied with naval aeroplanes and fitted to use them, just as soon as we can determine exactly what is needed for the fittings. This is the idea that prompted the use of the scout
"Birmingham" for the first demonstration in flying from a ship.

I go further, however, in believing that

I' aspital ships' and auxiliarea."

The reference may be found on page 650 and reads as follows:

"I agree that the navy should be made pof ships, as many ships as possible for pof ships, as many ships as possible for most urgent reason for placing them on the larger ships first, as soon as practicable, is that it is only by having the aeroplane right in the midst of the fleet, in the company of the officers and mechanics who must be made as familiar with it as they are with guns and boats, that we can expect to in-struct and exercise our people in its use and thereby study its efficiency for our pur-

> The French have designated the "Foudre" as a sort of base hangar for purposes of in-struction. Were we to adopt this policy, it would mean the use of any old hulk that could be spared and we would still be con-fronted with the difficulty of providing the officers and men to man her and the people to receive the instruction away from the ships to which they belong. Furthermore the policy that I advocate is to have this the poncy that I survoice is to have the instruction going on at every suitable place where the fleet is apt to assemble, in whole or in part, periodically or permanently. One "Foudre" could not be in all these

> piaces at once and the supplies that she is supposed to carry would be more conveniently carried on board of the necessary auxiliaries, such as the fuel ships, the trans ports and the repair ships.
>
> In view of our difficulties in getting bat-

tleships and essential auxiliaries from Congress, I hope the misguided author of this newspaper hoax will endeavor to correct the false impression that he has cr raise impression that he has created con-cerning this absolutely impossible special "hangar ship."

However, I do not wish to attribute any

but the best of intentions to this author, although he ruffled me a bit by committing although he ruffled me a bit by committing me to a preference for the products of a certain factory. But I feel that he must have good intentions because he places me in the ostegory of a "young offleer," and I am ned to hope that it is because he has in mind an essay that I wrote for the U.S. Naval Institute in 1884. I was young then, but, on page 30, Volume XI, may be found the following precept: "The great secret in naval economy, which many nations have set to hears for

# REDUCE FRICTION In the end friction destroys all motors

Without friction your motor would never wear out.

Friction slowly but steadily wastes the power and wears the moving parts of automobile motors. This accounts for their short life.

To reduce this friction you should secure the nearest possible approach to perfect lubrication.

That involves the quality of your lubricating oil and its fitness for your motor.

Different types of motors demand different grades

The spring-strength of the piston rings must be considered; the fit of the piston into its recess; the length of the crankshaft and connecting-rod bearings; the feed system; the length of the vacuum period, while intake and exhaust valves are both closed.

Before correct lubrication can be determined, these and other important considerations, must be dealt with.

In producing Gargoyle Mobiloils we studied the construction of every American automobile and many foreign makes.

We have drawn up a list of recommendations, showing the correct grade of Gargoyle Mobiloil for these various cars.

A partial list is printed on the right. The complete list will be mailed you on request.

These oils and recommendations come from the Vacuum Oil Company, recognized by power-engineering circles throughout the world as the authoritative leaders in lubrica-

The oils specified will give the nearest approach to perfect lubrication that you can secure.



They are put up in barrels, half-barrels, and in 5 and 1 gallon called, white cans All are branded with the Congoylo, which is our mark of amplesture.

They are blacked by the higher class garages, automobile needs stores, and others who supply lubricants.



A guide to correct Automobile lubrication

metion: In the schedule the letter opposite that is the grade of Gargoyle Mobiloii that should be ample. "A "means" Gargoyle Mobiloii A "" "Gargoyle Mobiloii A "" To recommendations cover a stoyle Mobiloii A "I he recommendations cover and commercial vehicles unless otherwise note.

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# VACUUM OIL CO., Rochester, U. S. A.

General Sales Offices, 29 Broadway, New York City Distributing warehouses in the principal cities of the world.



# The Right of All the Way

Railroad service and telephone ervice have no common factors—sey cannot be compared, but pre-ent some striking contrasts.

Each telephone message requires the right of all the way over which it is carried. A circuit composed of a pair of wires must be clear from end to end, for a single conversation.

A bird's eye view of any railroad track would show a procession of trains, one following the other, with intervals of safety between them.

The railroad carries passengers in train loads by wholesale, in a public conveyance, and the service given to each passenger is limited by the necessities of the others, while the bisphone carries messages over wires devoted exclusively for the time being to the individual use of the subscriber to the individual use of the subscriber could not afford the exclusive use of the railroad track between New York

and Chicago. But the telephone user has the whole track and the right of all the way, so long as he desired it.

It is an easy matter to transport 15,000 people over a single track between two points in twenty-four hours. To transport the voices of 15,000 people over a single two-wire circuit, allowing three minutes for each talk, would take more than thirty days.

The telephone system cannot put on more cars or run extra trains in order to carry more people. It must build more telephone tracks—string more wires.

The wonder of telephone development lies in the fact that the Bell System is so constructed and equipped that an exclusive right of all the way, between near-by or distant points, is economically used by over 24,000,000 people every day.

# AMERICAN TELEPHONE AND TELEGRAPH COMPANY AND ASSOCIATED COMPANIES

One Policy

One System

Universal Service

# The Scientific American Handbook of Travel ith Hints for the Onom Vayage for European Tours and a Practical Guide to Landon and Paris By ALBERT A. HOPKINS. Editor of the Scientific American Reference Book

AT last the ideal guide, the result of twenty years of study and travel, is countried to the countried of th

Munn & Co., Inc., Publishers, Scientific American Office, 361 Broadway, N.Y.

# The Mechanic, the Farmer, the Man of the House all sharpen their tools with

# <u> S-harpening S-tones</u>

The hardest, sharpest and fastest cut-ting sharpening agent the world has ever known

There is a Carborundum Sharpening Stone exactly suited to every sharpen-ing requirement.

And there is a Carborundum grinder to meet the needs of every type of work in the shop or home.

The Carborundum Company Niaggra Falls, New York



d alongside the Brooklyn Bridge. We have had to show this car head-on in the picture, because our page is too narrow for a side view.

in 1911 is estimated at 677,000. These, if put into a single car, would make one 660 feet high, and we would scarcely have room ont page for even a head-on view of the machine.

Though comparisons of bulk are very convenient, we must confess that they do not convey an adequate idea, particularly in products of the nature of automobiles, whose value is represented by the work done upon them rather than by the quantity of material used in them. According tity of material used in them. According to to a recent Consus Report, the value of the automobile industry in 1909 stood at \$249,322,000 for the product and for the value added by manufactures \$117,565,000, and in this particular it ranks seventeenth among the big American industries. The same report gives the number of wage correct semipored in the manufacture of earners employed in the manufacture of motor cars, bodies and parts, as 75,721. Our comparison falls short when it comes o showing the number of wage e the value of the product. It will be readily apparent to anyone that the grant automo-bile made up of materials that went into all the automobiles manufactured last year wand consequently much less hand or ma-chine finished surface than that of all the automobiles considered individually. Con-sequently, there would be far less labor in-volved in the making of this huge automo-bile and the value added to the product by manufacture would be much less propor-tionately. all the automobiles manufactured last ves

The Census Report just referred to give the per cent of increase of all the big American industries from the year 1899 to 1909. Only fourteen industries show an increase in output of more than 100 per cent, but the motor car industry shows an increase of 3,278 9 per cent increase in number of wage sarriers. The next best industry in the latter particular is that of electric rer particular is that of electrical machin-ery, apparatus and supplies which shows a percentage of 107.7, while the second best as regards value of products is 155 per cent shown by the copper, tin, sheet-iron

The automobile industry may now be said to have passed its period of infancy and adolescence, and attained an age of said to have present to partial an age of maturity. Hitherto there have been such marked changes in design from year to year, that car owners were constantly dis year, that car owners were constantly dis-carding their old cars and buying new ones. Now the automobile has reached a stand-ard form. Such new developments as are found in the annual catalogue relate to non-essentials and minor details. The man who buys a car to-day may be assured of a machine that will last him for a number of a manime that will tast nim for a number of years without growing hopeleasty out of date. In the next ten years, therefore, we cannot look for anything like the increase in production that was abown in the deende just past. Despite this fact, however, the utomobile industry has not yet reached the peak of maximum production. Our esteemed contemporary, the Automobile, after writing to the automobile manufacturers of the country for confidential reports of their output last year and their reports of their output has year, obtained their probable output this year, obtained the figure for 1911, which we have already given as 200,957 cars, and the probable output for 1912 as 247,427 cars. The prooutput for 1912 as 247.427 cars. The production of cars in the first two or three months of the year is always higher than for corresponding periods during the balance of the year. In January 1818, 422 cars were produced as against 28,681 in January, 1911, and in Fobruary of this year 70,242 as against 24,265 last year. Very widenly the estimate of 40,000 odd cars more than last year on the total year's recolution is not at all too larse. production is not at all too large.

How can this enormous production of cars be disposed of if we accept the esti-mate of 677,000 automobiles now in use, or one in every 140 of the population? cars be disposed of if we accept the estimate of 677,000 automobiles now in use, or one in every 160 of the population! This estimate by the way was very carefully compiled by the Automobile and in as reliable as any that oan possibly he made, all the movement is to be found in our front-page.

All communications are stringly confidential. Our vast prestine, extending over a spirit of more or than sixty years, easiled life with more than sixty years, easiled life without any expense to the client. On Hall Book on Reasons is easily few on the confirmation of the sent free one or in reset of PATENTS. TRADE MARKS, FOREIGN PATENTS, es. All patents secured through us are disputhed without sort to the patentes in the SCIENTIFIC AMERICAN.

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illustration which shows what an enorm export business is now being done. The automobile was introduced into this coun-try from abroad, but while we used to import large numbers of cars, the imports are now dwindling very rapidly. In the year 1909, 1,645 cars were brought into the country. The next year the import country. The next year the import dropped to 1,024, and last year it fell be-low the 1,000 mark to 972. In the same year our export grew rapidly. In 1909 we shipped out of this country 4,686 cars; in 1910, 8,443 cars, and last year the figures leaped to a total of 15,807. These quantities are shown in the illustration by single cars representing the import and export, respectively, for the different years. It will be observed that the car for 1911 is quite a sizable one compared to the total production of the year. Our illustration also shows the amount of money paid out for imported machines and the amount taker imported machines for the amount taken in on exported machines for the same year. This money represents the actual value of the cars and does not take into account large sums taken in for the export of automobile parts and tires. Most of last year's products went to Canada, which took nearly 5,000 automobiles at a value of \$5,500,000. Large quantities were also exported to Great Britain, particularly the

exported to dreat britain, paracountry in-mailer cars. Census figures place the total at 4,021, valued at \$3,380,266. An advance bulletin just sent out by the Bureau of Statistics places the probable total of exports for the fiscal year ending total of exports for the issea year ending. June 30th, 1912, at \$27,000,000 worth of automobiles and accessories parts. During the ten months ending with April 17,000 automobiles have been exported, worth about \$16,500,000; and adding to this the value of automobile parts, engines, tires, etc., we have \$22,000,000 for the ten months. Only one country in the world exceeds us in exports of automobiles. France sent abroad \$24,640,000 worth in France sent abroad \$24,640,000 worth in 1908 and her trade grew to \$31,700,000 last year. In the same period of time our ex-ports grew from \$5,000,000 to \$20,000,000, and in all probability the United States will take premier position within the next two or three years.

The value and cheapness of the Amerian product is being recognized throughout the world. American automobiles are sold the word. American automobiles are sold in all European countries and the market is increasing every year. We have an ex-cellent opportunity to sell machines in South America and no doubt this field will be cultivated from now on. It seems, therefore, that although we at home are beginning to use our cars for longer periods and are satisfied with second-hand cars, there will be no curtaining of the output of the antomobile manufacturer for a long time

# Resuscitation from Electrical Shock

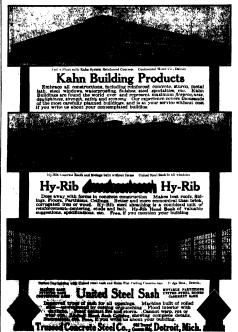
(Concluded from page 68,)

Seattle, in June, and adopted, but are still subject to any improvement that may be suggested and is really worth adoption The booklet rules include a section on the se of Burns," and are to be issued in a flexible cloth cover.

Two other important subjects still re main for disposition. One of these is the approval or recommendation of devices for continuing artificial respiration. The commission has already examined some of the devices obtainable, and will report its conclusions later. It believes thoroughly in the desirability of a practical apparatus which will furnish thorough ventilation of the lungs, for even the best manual treat-ment may be far from satisfactory or infallibly efficacious. One of these devices has, it is said, proved very effective in its

has, it is said, proved very effective in its treatment of the lower animals. But there is left the third great work of the commission. It has followed Goethe's advice in attacking the question that was ext or nearest at hand, and has laid down next or nearest at name, and nas said down rules that will save many valuable lives. The third task of the commission is an in-vestigation of the possibilities of restoring the fibrillating heart of a shocked person to its natural pulsation. On this part of the subject, Dr. Cannon, president of the explicit, again; "The electric current may kill prict, agas: "The electric current may kill





# THE WONDERS OF CHEMISTRY

If "Where will you find a young man whose curiosity and interest will not immediately be awakened when you put into his hands a potato," said the great Pasteur over fifty years ago, "when with that potato he may produce sugar, with that sugar, alcohol, with that alcohol, ether and vinegar? Where is he that will not be happy to tell his family in the evening that he has just been working out an electric telegraph? And, gentlemen, be convinced of this, such studies are seldom if ever forgotten. It is somewhat as nns, such studies are seidom it ever lorgotten. It is somewhat as if geography were to be taught by traveling; such geography is remembered because one has seen the places. In the same way your sons will not forget what the air we breathe contains, when they have once analyzed it. When in their hands and under their eyes the admirable properties of its elements have been resolved."

I More astounding than ever are the achievements of the modern chemist—more astounding than even Pasteur dreamed. Who would have thought that rubber—real rubber—could be made out of turpentine, out of potatoes, out of coal tar—three widely different substances? Who would have thought, twenty years ago, that sugar, steel, flour, almost every article of necessity, would in this year nineteen hundred and twelve be made not by haphazard rules of thumb in a factory, but by trained chemists, armed with instruments of precision, with test tubes, and retorts? Who would have thought that even the time honored art of cooking would be reduced to a chemical basis and that the kitchen would become a kind of laboratory? That the broiling of a steak or even the mere poaching of an egg would become a matter of chemical concern?

The next mid-month number of the Scientific American which will bear the date August 17, will present some of these marvels.

Only the business side of the chemist's activity will be dwelt upon; for here in the last few years amazing results have been

¶ Price fifteen cents on all newsstands.

one control of the muscles of respiration or by stopping the regular beat of the heart. When the heart is seriously as art. When the heart is seriously as-ted, it ceases to contract as a whole, but continues to contract in parts here and there, so that it appears to quiver. It is then said to 'fibrillate.' In this condiis then said to morniste. In this condi-tion the heart falls to keep the blood cir-culating, and death quickly results. At present no practical procedure has been discovered which will restore the regular fibriliating. The chief hope of resuscita-tion for the present lies in proper treat-ment of the cases of paralyzed respiration, and the immediate necessity in th es is promptness in applying artificial respiration and continuance of the proce until natural breathing returns. In some instances, however, the heart may be merely weakened without being made to fibrillate: then again artificial resolvation may be of vital importance, because a greatly weakened heart leads to impairment or total stoppage of respiration, which in turn destroys the last vestige of the heart beat. In all cases, therefore, an attempt should be made to restore natural breath ing." Here, then, is a grave problem that has heretofore defined all the resources of medical science. While the efforts of this notable commission may once more he attended with failure, it is well that the attempt is again put forth to win such a boon for mankind. Electricity has done so much to change the older conditions of life and civilisation, one is some tions or live and civilisation, one is some-times tempted to appropriate to it the inspired saying: "Behold, I make all things new;" and certainly it never had a nobler field of effort than this to which that progressive body, the National Elec-tric Light Association, has pledged its financial and inventive resources.

her by temperarily paralyzing the nerv

## Blowing Up a Locomotive Boiler (Concluded from page 89.)

mted water gages were mounted on the back head of the bollers, and these were read through a telescope which was mounted on the crest of the bomb-proof. Each boiler was brought to a condition corresponding to its regular operation in railroad service, when it has an estimated maximum power of fourteen hun-dred horse-power, which is equivalent to that required to haul a heavy passenger train sixty miles per hour. The supple of feed water was then shut off, all the other conditions remaining unchanged.

The water level, under the control of the operators, gradually fell, exposing the Wm. Gardam & Son, 52-86 Park Pines, N. Y. crown sheet and other portions of the heating surface to the full effects of the fire. Under normal conditions, these and faces are protected from over-heating by contact with the water; but in these tests the lowering of the water level deprived the plates of this protection and they be-

ame red hot.
The boiler with the Jacobs-Shupert fire box was continuously tested under these severe conditions for fifty-five minutes without developing any failure, notwith standing the fact that the level of the wa inches below the crown sheet. It may have fallen lower, but the water gage glass did not read below twenty-five. The test was then discontinued because the small amount of water remaining did not evaporate sufficiently fast to supply the draft necessary to maintain the fire. the conclusion of the test, the firebox apparently in good condition and read;

The ordinary radial-stay boiler wa then tested under conditions identical to those above described. After the test had been in progress for twenty-three minutes, and the water level had fallen to 14% inches below the crown sheet, an explosion rred. The crown sheet and the stays which hold it in place, having become highly heated, pulled away from sect other and released the pressure in other and reigned the presence in the holler. The discharge of status with through the frebox, and the farms of the employee threw parts of the temperature all directions and neveral continues to



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rouning or vesses.

Scientific American Supplement 1643—The Gyroscope for Balancing Aeroplanes, takes up this interesting field, which the gyroscope alone aeems capable of occupying.

Scientific American Supplement 1645—The Theory of the Gyroscope, is an excellent article, treating the subject mathematically rather than

Scientific American Supplement 1649—The Cyroscope, is an article giving a full discussion of the instrument without mathematics, and in language within the comprehension of all interested.

sanguage within the Comprehension of an interested.

Scientific American Supplement 1694—Gyroscopic Apparatus for Preventing Ships from Rolling, takes up the Schlick invention described first in No. 1621, and discusses its action and results fully.

Scientific American Supplement 1716—A Recent Development in Gyroscopic Design, illustrates a new form of gyroscope and mounting adapted to engineering uses.

Scientific American Supplement 1741—Cyroscopic Balancing of Aerd-planes, tells of values suggested methods of maintaining equilibrium. Scientific American Supplement 1773—The Wonderful Gyroscope, gives diagrams of the gyroscope and its action, and applications to maintaining stability of ships and moneral trans.

Scientific American Supplement 1814—The Regnard Aeroplane, describes the latest design of aeroplane stabilizer, from which great things are expected.

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the entire boiler, weighing forty tons, sev eral feet above its foundation. was so damaged as to render its reconstruction necessary.

The steum pressure during the Ja Shupert test varied between 215 and 225 pounds for the first twenty-seven minutes, and gradually dropped thereafter until it reached fifty pounds at the end of test. The steam pressure on the radial boiler varied between 200 and 230 pounds seing 228 pounds when failure occurred. In the boiler which successfully with-

stood this severe ordeal the place of the radial staybolts is taken by a series of deep flanges, which extend from the outadde botter shell to the toper shell of the The firebox shell consists of a firebox. series of U-shaped channel sections which are riveted to the inside edges of these flanges. This affords an exceedingly strong construction. Not only does es U-section present an arched form well calculated to carry the pressure, but the very strong riveting of each section to the inner edge of the flunges presents an enormous amount of sectional area to withstand the shearing stresses which must be overcome before the crown sheet can be torn loose and crushed in.

# Luminous Phenomena Associated With Earthquakes

THERE is an old and widespread belief that great earthquakes are usually pre-seded, accompanied, or followed by various luminous phenomena, in the earth or the These are sometimes described as vague illuminations of the air as a whole, glows and flashes of undefined source, phosphorescent clouds, etc.; or more definitely as lightning-like discharges (including fire-balls), flames and columns of fire proceeding from the ground, and phenomena resembling shooting stars

sembling snooting stars.

Prof. Ignazio Galli, of Rome, has taken
the trouble to collect descriptions of these
phenomena from all available sources, and
has made them the subject of an elaborate memoir, originally published serially in the Bolletino della Societa Sismologica Italiana, and subsequently issued as a separate pamphlet of 230 octavo pages. The author cites textually 148 cases, dating from before the Christian era to the 20th century. Of 130 cases, 27 occurred by day and 103 by night. An analysis of 109 earthquakes shows that 52 were preceded, 37 accompanied, and 20 followed by luminous phenomena. In connection with the great Calabrian earthquake of 1905, such phe-nomena were reported from 42 localities, chiefly as having occurred before the earth quake

Undoubtedly many of these ph were ordinary lightning flashes accompanying thunderstorms. When a quake occurr in a town, concomitant luminous phein a rown, concumitant immous par-momena may easily be explained as the result of fires breaking out in buildings, the sparking of crossed electric wires, etc. Other cases may be attributed to the igni-tion of subternanean gases, released by the rupture of the ground. There seems, howrupture of the ground. There seems, how-ever, to romain a minority of cases, especi-ally when the luminous appearances pre-ceded the earthquake, in which none of these explanations apply. As to the lumi-nosity of clouds and fog, this phenomenon has often been reported, but by no means commenting on Galli's memoir in the Comptes Rendus, Comte de Montessus de Ballore, director of the Chilean seismologi-

Ballors, director of the Chilean sesimologi-cal service, gives an analysis of 135 reports received in connection with the great Chilean earthquake of August 16th, 1906. After this earthquake question blanks were sent to all parts of the country, and among the items of information requested was a report as to the occurrence and character of luminous phenomena. Unfortunately for the particular object in question, severe thunderstorms prevailed in Chile at the time of the earthquake, and a majority of When it stores (it is an size he as yout goes, which is the proposed of the service of the servi



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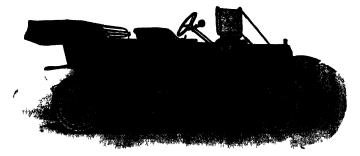
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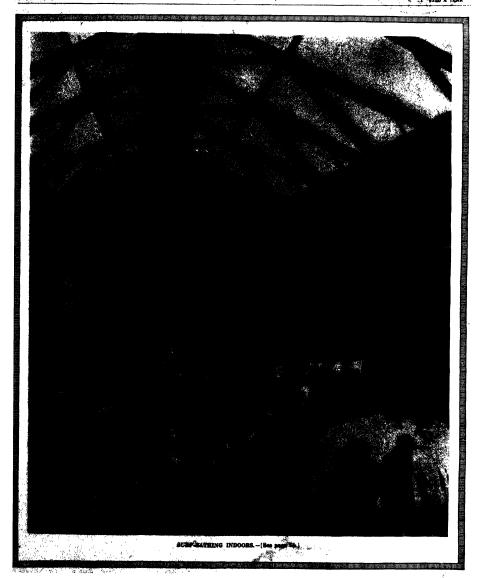
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The purpose of this journal is to record accu-rately, simply, and interestingly, the world's progress in scientific knowledge and industrial

#### The Senate Bill for Safe Ships

THE bill introduced in the Senate by Senator William Alden Smith who conducted the Titanic inquiry commends itself to the serious consideration of the owners and builders of ocean going steamships and the general traveling public. It was inevitable that several bills relating to the subject would be introduced in Courtness. Some of

It was inevitable that several bills relating to the subject would be introduced in Congress. Some of these call for measures which are impracticable but the bill of Senator Smith shows that whatever cititelesus may have been made of his methods of conducting the Pitanic inquiry he has very cle arned the lessons of the great disaster both as to the causes which led to it and the remedial measure which must be taken to prevent its possible recurrence

the SCIENTIFIC AMERICAN has claimed from the very first that the most important lesson raught by the disaster was that present methods of constructing large occus going stemmships do not make adequate providen to protect their dotation in the event of collision So far as her strength was concerned the consists. So mr as her strength was concerned the Titanic was a most excellently constructed ship. The great defect in this vessel and in at least 95 per cent of the merchant ships affont to-day is that the pro-visions against shiking such as bulkheads water tight decks and the dotble skin are altogether too few and such as exist are insufficiently worked out

Therefore we are gird to note that the smith bill calls for the inclusion in ocean and coastwise steam viscosis of certain safety elements designed to protect the flotation which as we have shown in those col mans would have saved the Titank had they been present within the structure of that ship. If the bill becomes haw it will be necessary for every steel ocean of constwict sengoing steam vessel and every steel steam vessel invigating the Great Lakes carrying one strain visser invigating the great Lines currying one hundred or more pissengers to have a watertight skin inheard f the cut-side pinting. This skin must extend not less than 10 per cent of the load draft above the full load water line, either as an extendion of the inner bottom plating a in the form of longitudinal water tight buildhoods and it must reach from the for ward collision bull head over not less than two thirds

of the length of the vessel.

The transve's bulkhrads are to be so spaced that
ary two adjucent compartments of the vessel may be y two adjacent compartments of the vessel may be oded without destroying its floatability or stability We could wish that the bill read any three adjacent collision with mother ship or a long toring wound such as that received by the Titanic whether through the side plating I through the double bottom might fid at least three compartments

The transceise lutkheads forward and abaft of the machinery spaces are to be continued water tight ver tically to the unpermost continuous structural deck, and this deck is to be fitted water tight. Bulkhends within the limits of the machinery spaces must extend not less than 25 per cent of the draft of the vessel above the load water line and they must end at a water tight

Applying the foregoing regulations to the Titanic it would mean that the first four and the last three bulkheads would be carried up to the shelter deck about 10 feet above the water line and the bulkheads throughout the engine and the botter 100m spaces would be carried to the upper deck to a height of about 10 above the water level

Finally all water tight bulkheads and decks must

be proportioned to withstand, without material pe maneut deflection, a water pressure equal to 200 more than the full height of the bulkhead. Bulk of novel dimensions or exacting are to be tessed by actual water preserve. The bill would be improved it this read that all bulkheads before being peaced by the surveyors should be tested by actual water pres-

The bill as we have said, makes excellent provision for safeguarding the flotation of future ships. We suggest, however, that it would be much improved if a clause were added stating that all openings lead-ing from the boiler and engine rooms and the holds to the shelter deck must be inclosed in steel water-tight trunks, or casings. This provision should be so worded as to apply to openings for boiler uptakes, ventilating shafts ladders and cargo hatches. The provision of such casings would prevent water, which might enter the ship below the water line, from rising above the water tight deck and flooding the decks above.

#### The Royal Society

LMOST every emissent Englishman seems at some time to have towed into a hat a handful or so of that form of carbohydrast food used in the making of "alphabet soup" to have taken out at random, just as from a obuvela far "grab beg," a number of these letters and have suffixed them in a long string to his natal and heritanial seasons that the standard seasons that the standard seasons the standard seasons that the standard seasons the standard seas letters and have suffixed them in a long string to his natal and haptimal organism. Among these securingly ad-ventitious combinations the most highly prized by Eng-lahmen of secione is that denoting fellowship in the Royal Society of London for Improving Natural Knowl-edge. This superb natitution—when mue presse sailed sumply the Royal Society—on the 18th of July cele-brated its 20th anniversary. It was founded by Charles II, of otherwise rather nebuloss memory, and all the male successors on the British throm has to been members,

male successors on the Brush throne has e boon members, including the present King, who evinces a very sative interest in its welfare and in its beneficent deliberations. Representatives of the French Academy, which Cardinal Bichelieu founded only a few years before the Royal Scotety, attended the anniversary celebration. The Scotety seems to have been originated, not by an Englishman, but by a German—Theodom Flask, who came from the Palatmate and instituted in 1645 weekly meetin of divers worthy persons inquisitive in natural philof divers worthy persons inquisitive in natural philosophy and other parts of human learning, and particularly of what has been called the new philosophy, or experimental philosophy, and another German, Heinrich Oldenberg, was the first severetary Three years later a sister organization, the Philosophical Society of Oxford, was founded in that university A most friendly inter-course was maintained until, in 1660, under the chair course was maintained until, in 1669, under the char-manhip of Dr Wikins, their sourtiess were joined in a metropolitan corporation for promotine; 'physico-mathi-matical, appearmental learning and philosophy' for Robert Moray was the first president, and among others have been Newton and Later Several great Americans have been or are fellows—Benjamin Franktin, Bengamin Thompson (Count Rumford), Alexander Agassiz, St Newcomb, Dr S Weir Mitchell

The membership has from the beginning been limited The memoeramp has from the beginning been unused to fifty-five, most of these famous men have ever been and are advanced in years on joining the Society, such fellowship meaning to them the crowning point of a career devoted to science. And there are fitly honorary foreign members, without power and selected by the council from among men eminent in science abroad. The annual election of officers is held on the day of the Society s spiritual patron, St Andrew It receives from the British Government an annual grant of £0,000 A the British Government an annual grant or LU,000 A report on its conniderable trust funds and its other sources of revenue is published annually. Its expenditures are for the public weal, every year thousands of pounds are devoted to the promotion of scientific research, and to

for the public weal, every year thousands of pounds are devoted to the promotion of scientific research, and to paying for the experimental work of scientific research, and to paying for the experimental work of scientific research, and to paying for the experimental work of scientific research properties of the State and Crown in all matters of science It is officially represented on the governing body of every kind of governmental and seem-public scientific said other educational institution. Its counsel is sought and given on matters annumerable. It keeps ever in touch with learned societies throughout the world.

It has the unitody of the standard copies of the Imperial Standard yeard and pound, it controls the National Physicial Laboratory, which was established by the Glovernment on its resoummendation; it superisticates the New and the Greenwich observatories, on its initiative, and by its advise, the Grovernment inasquenised the geodetic survey in 1791. Other enterpress which have had the Sweety's add a Covernment in the Sweety's and a continuative section of the globe; the various Arvide cover the trainet of Vester specifican Cooperson on the questions of a prime united skip, and between the questions of a prime united skip, and between the Challenger' expeditions in the Saterational Scientific Challenger' expeditions in the Saterational Scientific Challenger' conditions of the globe; the various Arvide scool and sections a seminodored investigation systems, its feld observations as sundored in the Sateration of a single science of the science of the coord-bifulness; satel spice side side side of counteration.

gratulated upon the sessions, rate in New York from age ratiolated upon the control of the control of the forty-six years covering the period of the control of the con

it of th conquest of disease is one of the greatest satisfaction in contemplating a reduction per cent in the death rate of New York, our elimina-tion for those thoughtful, highly intelligent and always industrious men who, in the quits of the Mouratory, have been carrying on the fight against disease, becomes the greater when we remember that what has been done in this city has been done also in a hundred

others

A reduction of over 50 per cent in less than fifty
years in the death rate justifies, guesty, the loops bigst
before another fifty years has passed geisless will
have obtained a complete mastery of infections disasses, and manifold, duce the prey of superstition abilin predisposing dread, will have realised titlat if peritain. simple salutary laws are followed, it can live its day-by-day life free from all four, even of the great willte

Certain diseases there are which to-day remain us conquered, chief among which is the last-named. Yet even these are gradually being brought under control. evan these are gradually being brought under control, and the progress in heterology, particularly during the past decade, has been such that, even in the labors, tories (where predictions are never made) one can detect a notiv of strong hopeduluses that consumption and the few other of the diseases which have higherly stubbornly withheld their secrets, will be brought with-in absolute control. in absolute control

It is an amering fact that the very methods by which the bacteriologist has achieved his wenderful success are being bitterly littached. Had it not been success are neing outerly attached. First it not been for the practice of vivisection, this 50 per cent reduc-tion in the death rate could never have been accom-pliance No far from the bacterislogical investiga-tions which have been made in the laboratories of this and other cities being marked by needless crasity, the discomfort or pain which may have been suffered by a certain few dumb animals has brought untold benefit

#### The Exiles of the South Orkneys

HE heroism of the cosmopolitan group of scientific men that keeps in operation the Argen-Tocientific ment that keeps in operation the Argentine meteorological station in the Booth Orkneys attracts surprisingly little attention, even from the scientific public. The station was originally established by the Scottish Amareric Expedition of 1990-04 and was taken over in 1904 by the Argentine Meteorological Golfee Every year a party of four—three observers and a cook—is sent out from Buenos Aires to spend a year a cook—is sent out from Buenos Aires to spend a year. a cook—is sent out from Bussnes Arres to spend a year of extle in this inhospitable sput, which, although north of the Autarctic circle (lat. 60 deg. 40 min.), is generally ice bound, and has a truly polar climate. The mean namual temperature is 22.8 deg. Fahr The smoowfall is excessive, smushim is rare, and strong gales. are frequent. Moss and lichens are the only vagetation.

From a purely scientific point of view, the study

From a purely scientific point of view, the study of the winds and berometric pressure distribution of the Antarctic is peculiarly interesting on account of its comparative simplicity. The South Fole lies at about the center of a dome-shaped continents glacier, so that the wind-system belonging to the planetary cir-culation and that due to ay ferdungs down the glacier elopes are appreximately concentric.

so that the wind-system belonging to the pianetary circulation and that due to six frainings down the sizedar elopes are approximately concentrate. It is everywith desirable that other fixed and permanent meteoreological estations, should be essagistated in the south polar regions. Pending this consummation, the onlightened policy of the dispusable government in multi-staining a station is it the Sentil Orizone, at a cost of from \$89,000 to \$83,000 a year, is most commenced able bipocial princip. However, is due to the deprecedable bipocial princip. However, is due to the deprecedable. They related to the state of the principle of the department of 17. Charcon's least Asstancial explosition, in a report address before the finite of the relating of the south of 17. Charcon's least Asstancial explosition, in a report address before the finite of the relating of the south of the continual princip. Never the south of the so

Fig. Second Recommender. The French sarry is following the land of Genial British and the United Street by Investment of the Street and reducing the number of gines in her main betteries. The three new battlendipt, the "Lorenton," the "Revigen," and "Province," of 18,500 tons, will carry ten 18,5-inch gun, all placed on the ionarisonal carrier lines of the slip.

on the longitudinal center line of the ship.

The Largest Warship.—Although authorities differ as to the dimensions of the recently-launched British satisfies the dimensions of the recently-launched British hattle-retises. "Queen Mary," there seems little reason to deaths that she is the largest warship affeat at the present time. Same authorities give her dimensions as follows: Length over all, 725 feet; beam, 87 feet; and displacement, 29,000 tons. She will probably make over 20 knots on trial, and to do this her turbine will have to develop not far short of 100,000 horse-power. The "Moltke," of 23,500 tons approximate displacement, required 90,000 horse-power to drive her at from 29 to 2934 knots.

Tairty Miles of Warships.—Great Britain has been the seeme of some remarkable naval mobilizations, of which, until this summer, the most notable was that held during the coronation festivities last year. In point of sise, however, that review was surpassed by the one held at Bytthead last month, when 230 warships and hittle, were drawn up in air parallel lane, which, if strung out in single line, would have extended for 30 miles. The significance of this display will be appreciated when it is remembered that Great Britain is building warships at a faster rate, and is building more of them, than at any period in the history of her navy.

Seesiting by Submariae Bell.—Four of our naval submarians, unique the submariae bell as thought source of communication, recently went in search of the "Casting," which represented an enemy's ship. The submariaes maneuvered in depths of from 20 to 60 rest, and finally the "Casting" was found and theoretically sunk by four torpedoes provided with dummy heads, which were successfully discharged at the ship. It may be mentioned that the submarine bell affords effective proteotion against collision, since the throb of the ongines of an approaching ship can be distinctly heart when the submarine is below the water.

heard when the submarine is below the water. "Titasie" inquiry Cencided.—The Board of Trade inquiry into the "Titanio" dissater has been concluded, and its President, Lord Mersey, has announced that its report will be produced "within a reasonable time." The Attorney-General referred to the inaction of Capt. Lord, of the "Californian," and said that he had come to the conclusion that there was no excuse to be found for his conduct on that night when, as the evidence showed, his ship might have reached the "Titanio" in time to save the whole of her passengers. He asserted that utterly unnocessary risks had been taken by the "Titanio," and that the causes of the disaster were a bad lookout and excessive speed.

bad losgout and excessive speed.

A \$3-knot Steam Yackt.—The turbine yacht "Winchester," built for P. W. Rouss, Enq., of New York, by Yarrow & Co, under the supervision of Cox & Stevens, naval architects, New York, ran her full speed trials recently on the Skelmonic deep water measured mile, attaining a mean speed of \$2½ knots. This was quarter of a funct in excess of the contracts speed. The "Winchester" is 205 feet in length and 18 feet 6 inches to breadth, and the trials prove her to be one of the fastest yachts affoat. The propelling machinery consists of Parsons turbines, driving two shafts and steam is supplied by two of the firm's water-tube boilers freed with oil fuel.

fired with oil fuel.

Hydraulic Transmission for Diesel Motors.—The Vulsan Company, of Stottin, are building two Pittinger transformers, capable of delivering 1,200 horse-power, for a vessel to be employed in the Conge trade. It begins to look as though the introduction of Diesel engines to no cosan-going ships, particularly those engaged in freight carrying, will produce a widespread demand for an efficient speed-reduction mechanism. Three types are available—the mechanical, the electrical and the hydraulic Telle mechanical leads in efficiency, the electrical in the wide range of spood control, and the hydraulic reduction gear, although lower in efficiency than the others, has the advantage of quick reversing, a wide ranse of speed and streat reliability.

for an efficient speed-reduction mechanism. Three types are available—the mechanical, the electrical and the hydraulic. The mechanical leads in efficiency, the electrical in the wide range of speed control, and the hydraulic reduction gaz, although lower in efficiency than the others, has the advantage of quiet revering, a wide range of speed and great reliability. Memorated to "Titualet" Bagineers.—One of the most striking instances of divotion to duty in the "Titualet" Bagineers.—One of the most striking instances of divotion to duty in the "Titualet" Bagineers.—One of the most striking instances of divotion to duty in the "Titualet" Bagineers, and is "all below"; and, judging from the first that not a signife member of the said of shirty-form, including John Bell, the Chief. Engineer, unrivined the displaces, the is believed that every one of these next (regispand at the post to the vary last sind want down with the slet, Engineer the world steir see invited to Scientificies to a Riching Fund 25 display to ever a suitable memoraid in Bouthampton. Contributions will be preceived in the United States by Mr. E. & Aldench, Frienceslennal Marine Engineering, 17 disting Tames, New York edy.

A Manual Comment of the Comment of t

#### Astronautica

Newest Record for Speed.—Vedrines traveled for two hours at a speed of one hundred and six nules an hour at Rheims, on July 18th. He broke all records.

The Wright Hydro-aeropiane School.—Orville Wright has decided to open a station at Glen Head, L. I., where the use of the hydro-aeropiane is to be taught. The station will be in operation, it is said, on or before August 1st.

The Aerenautic War Fund of France.—According to Le Temps the National Committee for Military Aviation has collected the sum of 1,280,373 france for aviation purposes. The National Committee has already turned over to the Ministry of War the sum of 500,000 france for the purchase of thirty-three aeroplanes

A Hydro-aero Bus.—Roger Sommer has built a hydroaeroplane which is to earry ax passengers. The machine is to be used on Lake Geneva. Tickets will be sold to tourists. The maximum speed is to be only forty-five miles an hour. Daily circuits are to be made from town to town around the lake.

Japan Buys Aeroplanes in America.—It has been announced at the office of Gleon H. Curtiss that the Imperial Japanese Navy has placed an order for three hydro-acroplanes, and that three Japanese Navy officers are now on their way to Hammondsport, where they will be taught to fly the machines.

A Gienn Cartiss Launching Machine,—Glenn Curtiss, the well-known a wintor, has secured a patent (No. 1027,242) for a means for launching flyung machines, which comprises a suitable mount with an accuplant supporting device pivoted upon it, in connection with which he provides means for imparting at a variable speed an angular throw to the supporting device so that the machine is brought to a position after it has attained a maximum velocity which position is seconding to the proposed direction of flight.

Accopiane Fleets for Argentina and Reumania.—The recent popular movament in Italy whereby the army of that country became possessed of a fine fleet of seroplanes has had parallels in Argentina and Reumania. It is reported that the Souedad Sportiva Argentina has offered the Minister of War an aerial fleet, the cost of which will be defrayed by the sale to the public of 1,500,000 illusrated postcards. A competition was recently held to obtain suitable designs for the cards, viz., allegencial representations of the military uses of avanton. An Aerial Lasque has been formed in Bucharset for the purpose of raising funds by popular subscription with which to buy accopiance for the Roumanian army.

De Pjrige-fish Pij?—This mucli-mooted question is discussed by William Allingham in the Nautoud Magazine. The orthodox scientific opinion is that the "winge and the discussion of the flying-fish merely serve as a parachute to sustain the fish for a brief period in the air, after he has launched himself out of the water by a powerful screw-tike movement of his tail. According to this view, the fish has left the water However, Mr. Allingham, who is a natioal expert attached to the Pritish Meteorological Office and is in constant intercourse with seamen, reports and principles of the principles of the purpose of flight. One vessel many observations that tend the controvert this opinion. Certain observers claim that the wing-fine are in constant rapid vibration, and seem actually to serve the purpose of flight. One vessel matter watehed a fish that had attitude an altitude of 20 feet above the water, and was flying toward the miszen rigging of his ship when, appacently noticing the obstruction, it changed its course about 60 degrees, crossing the vessel's stern to regain the water. Many other similar observations are mentioned. A criterio of one flight potential matter. Many other similar observations are mentioned. A criterio one and for all,

Death of Hubert Latham.—Hubert Latham, one of the pioneer savitors, was killed by a huffall on June 7th in a hunt in the French Soudan. He was one of the few men who first took up aviation and who was still flying almget up to the time of his death. The recthave either been killed or have gene into the asfer vocation of manufacturing. Latham took up firing very soon after Wilbur Wright made his domonstrations in France. He always flew an Antionstic monoplane. He had not been flying many months before he decided to cross the Channel. His first attempt was made on July 19th, 1909. He flew half-way across and then fell into the sea and was picked up by a French torpedo boat. After Blefrich had performed the feat, Latham made a second steenagh on July 27th, covering interess of the sweaty-two miles. Just off Dover he again fell into the Charnel, Latham was phenomenally lucky. He energed thine and time again from accidents without serious personal lugity, although he smashed machine after madding. In his day he was a record breaker. He hald resorts for endurance, height and speed, all of which, however, have since been broken. Americans will remember him as one of the contestants on the French team that competed at Belmont Park in 1910.

#### Automobiles

When Ecrosene is Uzeful.—A motoria from Marlon, N. Y., the other day was caught miles away from a garage, without a drup of gasoline on which to get home, Inquiry at farm houses nearly failed to reveal any available supply of the "precous fluid," and so he decided to try a can of kerosene. As the motor was still warm, he had no difficulty at all m starting it and finishing his run home without further truth of the decided to the control of the starting it and missing his run home without further truth.

Folding Chairs of Pressed Steel. Folding chairs made of pressed steel, which can be folded together so as to look like an ordinary muse holder, and slipped into a cover, are the latest in the accessory business. Although the weight of the dans is but thirty ounces, it is built strong enough to support a man weighing four hundred pounds.

Nickel Trimmings New Popular.—A large proportion of the 1913 output of the American automobile companies will have nickel trimmings. The beauty and durability of nickel, and the ease with which it is kept bright, commend its more general use. At any rate, it is a tastful compromise between the brilliance of burnished brass and dull effects of the more utilitarian finishes, such as gun metal

Subaldizing Motor Cars.—The British War Office has drawn up a provisional scheme for subsidizing "petrol motor lorrice" (t. a. gasoline trucks built for carrying heavy loads) built after January 1st, 1910, and owned by cavilians. The owners are to receive an initial subsidy varying from \$39 to \$58, and an annual subsidy of \$27, in return for which they are to agree to turn over their wagons to the government in case of war, at a fixed price.

Reinferced Bulb Horns—Bosause the ordinary bulb seed on automobile horns have invariably been a source of trouble and annoyance to the motorist, and because the various mechanical horns are making such a remarkable progress, a French horn maker has brought out a reinforced bulb for the ordinary reed horn, which has several unusual features. Instead of being amouth and slippery, the new bulb is ribbed horizontally and vertically, affording a good grip to the flagers and strengthening it to such an extent that it will outlast three ordinary bulbs.

Race Victories and Sales.—The public, of course, well knows that race victories influence to a certain extent the sales of cars, particularly of those of the "readster" type But it must come as a distinct surprise to hear of a German factory which by good judgment and good luck managed to wn three snocessive road races and one reliability tour, whereupon it received a cable order from England for no less than eight hundred chassis of the winning type. Previous to the winning of these races the enture output of the factory amounted to only one thousand cars.

Dual Wheels for Heavy Cars. Instead of mounting dual rubber trees on a weder-tunned wheel, for use on heavy-duty trucks, a New York tire expert has invented a dual wheel, which is said to have shown great efficiency in the trying-out process. The wheels are stagered, one spindle being in front of aud the other behind the line of the axic The spindles are connected by means of an equalizing har, which permits the wheels to follow the contour of the road and equally divides in New York by a well-known rim manufacturer, it is based on patents which were granted to Molesworth, the British scientist. The invention was improved and developed by Alexander Dow.

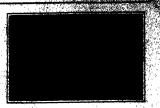
Emergency Steering Device.—Many of the most serious sections in fast driving, and especially in raceing, arise from the breaking of the steering knuckle and the subsequent serving of the front wheels. A Rochester mechanic has pastented a device which is designed to break the steering men. The main geer is attached to the machine and the second gen can be put to in if deviced. The former operates on a knuckle joint, while the latter acts devely beneath the steering wheel, and operates on a common serve connected with rods on which are bottled clusters are the steering wheel, and operates on a worm serve connected with rods on which are bottled collars set in a finings bottled to the wheels. The finances are constructed so the collar rests in them and runs on ball bearings, the two wheels heng connected by rods across the front of the machine, in addition to the usual ter rods. If the main gear breaks, the rods hold ke wheels from severing and steer as if sending had happened. If one of the rods of the devthe breaks, the other will do the work. If a nut comes off one of the whoels, the finances and collars will tend to preventing a bed annual-up; the machine will rest on the rods and give the driver a chance to come to a stop without turning a someward.



Fig. 1. A Central American Indian woman, a white boy and a negro photographed with ordinary light.



Fig. 2.—The same subjects photographed with invisible ultra-violet light.



### Black and White Men in Invisible Light

Tricks Played by Ultra-Violet Rays

By Gustave Michaud and Fidel Tristan, Costa Rica State College

EVERAL hypotheses have been advanced to explain the difference in color between the southern and northern races of mankind. None is entirely satisfactory. It occurred to the writers that some progress might perhaps be made toward the solution of the problem if the relative absorption of light by the white and colored skins was considered not only for the visible radiations, but also for the invisible yet ever-present ultra-violet and infra-red lights

A group composed of a dark-skinned negro, an Inwoman of a chocolate color with perhaps an admixture of negro blood, and a white boy of Alpine descent was photographed successively in visible light, in infra-red and ultra-violet lights. Foucault's filter (3,100 to 3,200) was used for the ultra-violet, the objective being a quartz lens silvered on both sides. Exposure in full smillshi. 3 minutes. For the infra-red, Prof. Wood's filter was slightly modified, the 15-gramme gelatin filter made by Messrs Wratten and Walaright. of Croydon, Engiand, was placed between two disks of copalit glass of the darkest shade used by oculists The spectrum panchromatic plates, sensitive to the infra red, and made by the above named firm, gave a

tolerably good image with an exposure of 7 minutes. The result was of a somewhat unexpected and confusing nature and is clearly told by the accompanying toming induce and as locary tom by the accommon and three photographs. The difference in the absorbing power of the black and white skins decreases from the infra-red to the ultra-violet. In the infra-red it is by far greater than in visible light. In the ultra-violet it is almost sii. Indeed, it may be said that, if our eyes were sensitive to ultra-violet light only, all men would be negroes, so far as color is concerned.

years ago, one of the writers (Scientific Ame-BIGAN, November 5th, 1904) ventured to explain the genesis of the white races of men through a process similar to that which bleached the fur of most northern animals which hunt or are hunted. During the whole Paleolithic and great part of the Neolithic ages, mun was ignorant of agriculture. In Abbeville, in Spy, in Mentone, in Hoxne, in the caves of Périg numberless flint or bone implements were found which prove that fact. The Paleolithic man was a hunte and this being recognized, it becomes easier to explai es easier to explain how his color was changed, like that of other north-ward-migrating carnivors, than to explain the reason rule. Primitive tribes were probably to the declinated by hunger, as the Canadian Indians of to-day. Those hunters who exhibited on the snow a sailow face, black hair, beard and eyes worked at a disadvantage when compared with somewhat lighter-complexioned comrades. They were more conspicuous on the white field, and could not so easily approach their prey within striking distance. When food was scarce, mortality was the greatest in their families; the lighter-complexioned individuals leaving in every generation the larger posterity. If that explanation holds good, it is rather easy to understand the reason why the selective prov which decreased the absorption of visible light by skin had no such influence on the invisible ultra-violet light. Why and how the same process should have deprived the white skin of the power of absorbing the warm and invisible infra-red radiations is by far more difficult to understand. It seems that such radiations are needed above all by the man who must withstand the effects of a cold climate. Yet the negro is the man whose skin is so organized that it can absorb

# "Heart Stopping" as a Profession

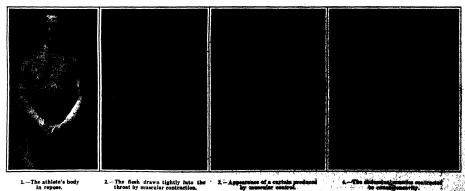
Examples of Muscular Control of Scientific Interest

By John B. Huber, A.M., M.D.

A MAN recently exhibited himself in London, who, ac-Acording to an imaginative press-agent, gave "an ex-traordinary demonstration of phenomenal muscle manipulation and stopping the beating of the heart," before ers of the medical profession in London. not find, however, any report of this demonstration. The press agent states that "by years of hard work, careful study and immense concentration of mind," the athlete in question "can manipulate his muscles to an extent never before deemed possible in medical his Many men have by exercises developed enornous muscles, but they have been invisible and remained firm to the touch even when relaxed. But this athlete can relax his muscles to such an extent that "by shaking his arm he can make the triceps quiver like reeds shaken by the wind." More than this, he can stop the beating of his heart for more than twenty seconds, and retard or accelerate his pulse at will, thereby defying the laws of nature. There is no authentic case of this feat ever having been accomplished before. In the second of the photographs here published the flesh has been drawn tightly into the

throat and up under the under jaws, by muscular contraction, "all being as solid as a block of marble."
In another the muscles of the neck are made distinct, Still another shows unusual manipulation of the abdo The athlete "can draw in his stome extraordinary degree and also protrude it as much in the opposite direction."

It is also claimed that this performer can remain nder water from six to eight minutes, and that he can live for a protracted time when buried in the ground. (Continued on page 65.)



1.—The athlete's body in repose.

# The "Commonwealth" - "New Hampshire" Collision

The Bulkhead and the Watertight Deck Prove Their Value

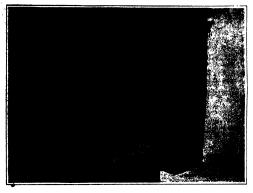
I'm would be difficult to find a better excission of theory borne out by actual position then occurred in the record accident to the U. S. S. "New Managalite" when run into by the Fall River Line steamer "Com-

The accident occurred in Newport harbor about 5 A. M. on the morning of July 7th. The battleship "New Hampshire," displacement 16,000 tons, was lying at anchor is a heavy fog, when the "Commonwealth," one of the most palatial of modern steamers, with a displacement of about 4,500 tons, rammed the steam of the battleship at a point shout at feet to starboard of the center line. Chance could bardly have chosen a better point for the centies line. Chance could bardly have chosen a better point for the centies line. Chance the could bardly have chosen a better line feet that the "New lampshire" full crew was about 750 men and the "Commonwealth" was probably carrying an equal number of people, not a single fataity or fajury of any kind receited.

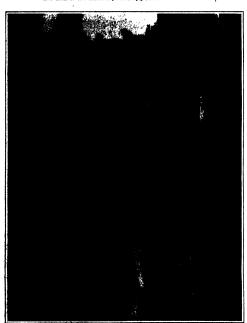
The general extent of the damroughly by referring to the two photographs, and it will be seen that as usual the body receiving the blow has suffered considerable ore damage than the body inflicting the blow. At first sight, it would seem that Newton's law of motion, "Action and reaction are equal and opposite in direction," is not evidenced here. Just here though the point is frequently over ed, that in addition to the structural damage to the "Common-wealth," the speed of her great mass was reduced almost immediately to and it is this consideration that brings the theory and practice in accord. Some idea of the force of such a blow can be approximated from the following extended: from the following calculation. e of any definite information on the subject, assuming a speed of 15 feet per second (corresponding to slightly over eight knots per hour which is considerably less than half speed for the "Common wealth"), and a displacement of 4,500 tons, we find that the energy of the blow which she delivered against the "New Hampshire" was about 16,000 foot-tons. This would he sufficient to lift the battleship one foot into the air.

In considering the relative effects of such a collision on the two vessels it is to be remembered that the liver investigation of the remember of the third precision of the remember of the liver practically broadelde es, so that her plating acted merely as a thin membrane for helding together the framing, and except in ansisting to transmit the stress to the framing the plating ireside could not be expected to contribute any material resistance to the blow. The "Opignouwwealth," on the contrary, delivered the thow with her knitfelite how armored with its steel imaget edge on, so to speak, and in the most advantageous way possible to smalle slike plating not only to transmit the stress to the s

Trainmit the stress to the families, in the size of such strees, in size size to the late of the size of the size



Bow of the "Commonwealth," showing how the steel protective deck of the battleship cut deeply into the bow structure



The protective deck of the "New Hampshire," upon which the seaman is standing, is intact. The lighter structure above was tern loose and driven into the shin.

The outside shell platting, % inch in thickness, from main deck to waste line was bent inhowed in a wedge-staped section corresponding somewhat win a wedge-staped section corresponding somewhat with the shape of the 'Commodyresith's' how. The point of impact at the rest of the nain dock had been boddly carried forward a dissause of over twenty feet, and, as can be seen friend the pickograph, shown no sign of cracking or rupture throughout the twenty feet of height between the protective and saint deck. The rivers, too, have apparently held well, showing surprisingly few heads snapped off. At the protective deck, 1/g, inches thick;

which on this vessel comes whathis below her water line, the platting and arrange have been the water line, the platting are the platting of the below of the large section of the large water that protective deck intact, and as good as the day if was originally in stalled. There was apparently no stalled. There was apparently in stalled and the platting of the protection of a benry watertight deck at on near the water line. The possence of this deck slightly below the water line and its absolute intactness prevented practically any water at all from entering the ship.

The pluting of the gun and berth decks has been considerably buckled and torn, and the four or five after beams and frames on both sides were so budly twisted as to require renewal. On the main deck the pluting and beams were budly bent, and the wood deck torn and shattered.

The compartments involved were the extreme after cabin of the commanding officer, the both and shower room for the wardroom officers, and the after staterooms on each side. In these spaces all fresh and sait water piping, centination duers, steam pipes, electric light fixtureswiring and conduit, Illing, etc. were completely weeked, together with a number of fittings, such as an iports, gumport shurters, deck stanichlous, flagganff, etc.

Several of the 2-linch intelest-step plates of armor protecting the after 6-pounder gains were bent through an angle of about 125 degrees, but gave no evidence of cracking, and the authorities expressed the bellef that these could be hented, straight ened and used again. One heavier slinch plate of armor at the water line showed evidence of having been slightly bent in on one corner, but no further injury was received by the water-line armor

There was apparently no damage done to the propellers, shafting or rudder, which can only be considered a piece of very good fortune

The repairs to the stern, which must be done with the vossel in dock, will probably be executed by cutting off the whole damaged potentian above the protective dock, by the use of pacumatic chipping hamers, and the oxy-accet bene fame and lifting it bodily off. This portion will then be replaced by a whole new stern, fitted complete in all respects, which will require an expenditure of about \$15,000 and six weeks time.

The damage to the "Commonwealth," which it is also estimated will cost about \$15,000 to repair, consisted of a broken stem and a very badly crumpled and twisted bow, which well involve the renewar of a large number of her forward plates and frames, and will necessitate docking the vessel. The injury sundained by this vesses shows the great value of efficient collision bulkheads, which held perfectly in

this case. The knife-like effect of the atmored protective deek of the battleship in shearing the shell plating and forward frames of the "Commonwealth" is plainly visible in the illustration.

The most gratifying thing about the accident, if indeed anything can be said to be gratifying about such an unfortunate occurrence, was the perfect order and discipline observed on both vessels immediately after the collision. In spite of the heavy fog that prevailed, and the fact that, except for those immediately on

(Concluded on page 87.)

### Artificial Surf Baths

### A Miniature Indoor Ocean

PROBARLY no feature of the International Hygiene Exposition held in Dresden last year attracted more general interest than the Undosa artificial surf bath. The receipts from the sale of bith tickets, and espe-cially of speciators' tickets, were unexpectedly large, amounting sometimes to \$450 in a single day. As the cost of operation was only about \$40 per day, it is evident that the artificial surf bath may be made a very profitable as well as a very beneficial institution.

The idea of generating waves in still water by alternately submerging and withdrawing solid bodies of appropriate form and dimension, originated with Hofrat Hoegianer of Munich, who in 1903 obtained a German patent for a wave-producing apparatus, which was subsequently patented in the United States and many other countries. The first experiment in the

outlay for the wave-producing apparatus would not exceed \$7,000.

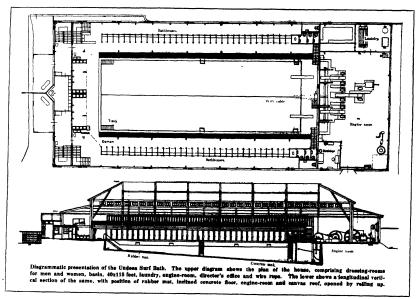
The mechanical device by which the waves are p of one or more hollow wedge-shaped bodies made of sheet iron, which are rhythmically immersed in and drawn out of the water by appropriate machinery. In situations in which the vertical elevation and depression of the wedges present difficulties the waves may be generated by oscillating vanes, but the operation is always so conducted that the water which rushes in to fill the void produced by the elevation of the wedge or the retraction of the vans passes the point of equilibrium and is heaped up by the return swing of the vane or the immersion of the wedge. The waveforming action, therefore, is identical in principle with

inclined in the usual manner, and the plus pliced at its lower end, where the depth was about 7 feet. The waves generated at the was about 1 leet. Ane waves generated at term unit of the busin were more than 8 feet in height, and as they moved toward the other end and reached a point where the Septh of water was less than their height they began to comb and break, and thus prod very good imitation of the surf of a natural sea beach

1.

very you turation of the surface of a natural sas beam.

The atrangement of the plungers or vanes, and the character of the impulse impressed upon the water, can be wirled in divers ways. Where space is limited, for example, a plunger could be attached directly to the example, a pumper could be attached directly to the plation rod of a vertical engine placed above it, as in one form of steam hammer. Plungers could be oper-ated in the middle of a long basin so as to send waves toward both ends. The two parts of such a bests,



production of an artificial surf both by this method was made in 1905 in a concrete basin built in Lake

The bath could be used only in summer, and, aithough It was very well patronized on clear hot days, it was evident that long periods of fine summer weather would be required in order to pay the operating expen provide for amortization and fair interest on the initial

It was left for the Dresden Hygienic Expe demonstrate that artificial surf baths can be made profitable by constructing them in such a manner that they can be used throughout the year in all sorts of weather. The directors of the Exposition had decided that the department of sport would not be complete without a large swimming bath in which swimming taces could be conducted. The constructor of the bath, Herr Reckingel, suggested that it be provided with a rectified swift and it as provided with a removable roof, and also with apparatus for producing artificial surf. This plan was finally adopted after much discussion and with grave financial misglyings. and the result surpassed all expectations. During the five months of its operation the both was visited by nearl) half a million persons and earned about \$30,000, which more than covered the cost of construction (\$20,000), and the operating expenses (about \$7,000). The cost of construction was diminished about out-half by the gratuitous contribution of many parts of the equipment by exhibitors, and the site cost nothing, but it appears probable that a similar enterprise would pay very well in normal conditions. The additional that of a stone thrown into a pond. If the stone falls close to the bank, so that the water can escape in only one direction, the height of the resultant waves in

.In the experimental plant in Lake Stamberg the waves were generated by three immersion wedges ar-ranged in a straight line, each of which was driven by a separate electric motor, in order to save space. Es motor was coupled directly to a flywheel. When When the motor, running without load, had attained the proper speed of rotation, the motor shaft was connected by a worm drive with a horisontal shaft carrying a crank from the end of which the wedge-shaped plunger was suspended. In designing the artificial surf bath at the Dresden Exposition steam was chosen as the motive power in order that the water of the bath and the air of the bathhouse might be heated by the exhaust steam At first the steam was supplied by the general power house of the Exposition, about 1,000 feet distant, but subsequently a locomorive boiler of 100 horse-power was installed in the bathhouse.

The wave-generating plungers were suspended from The wave-generating plungers were suspended from cranks attached to a shaft extending across one oud of the swimming tank, which was about 40 feet wide and 115 feet long. This shaft could be connected by belt wheels and clutches near its ends, with a counter-thaft at the middle of which was a wheel driver by a that the ingine shaft. The gearing was constructed to immerse the plungers 18 times per minute when the engine was running at its normal rate of 125

divided by the machinery and a screen, could be us

as separate baths for men and for women.

The height of the waves is conditioned by the volume of water displaced, and it can be varied within wide limits by varying either the travel of the plungers or the depth of water. For artificial basins the best practical method consists in varying the travel and disrical method consists in varying the travel and dis-tributing several plungers across the deep end of the basin. With three plungers constructed to be operated separately a great diversity of wave medion can be produced by using one plunger, two, or all three-if the three plungers, properly distributed, are oper-ded to the control of the plungers, properly distributed, are oper-ded to the control of the plungers, properly distributed, while it with one Designate waves of uniform angight; while it with one Designate waves of uniform angight; while it even one plunger remains idle, the waves go even one pumper remains idle, the waves generated by the others spread into the calm water in front of it, and thus lose force and height as they approach the farther end. By accelerating or retarding individual plungers it is possible, as observation has shown, to duce a very complex wave pattern rese

ctically all of the conditions presented by a natural beach can be reproduced by doing away with the vertical wall at the shallow end of the basin and exvertical wall at the shallow end of the institu and ex-tending the inclined floor well beyond the water line. The difficult act of swimming in rough water can be practized at one end of the bank, while at the other end bathers can enjoy the breakers, the outrunners or which furnish earls most near most for small children. All of these persons may desire benefit from the message effected by the moving water.

#### Correspondence

And the state of t

militors are not responsible for statements the correspondence column. Accommons on the considered, but the names of adopts will be withheld when so desired.]

#### The "Mawke"-"Olympic" Collisio

The "Sagwige". "Utympie" Collision
To the Siting of the Scuttering channels, it
To the Siting of the Scuttering channels,
Yourselels in Spreamers of Petruary 2sta, 1912,
poss 14s, suspects that there are some things that pilous
and provinces oft net know or have never reasoned about.
For instance, that then a vasted passes swiftly through
thate, and that waste is deep, the greater part of the
controlled religible hole where the reased was, comes from
their state of the struck by the propoller, which we know
in not the case. Unless these conditions, it is ask for vesate in smooth water on parallel courses to range alongside one another and sheer off with case.

Arsin, when a vessel passes writty through shallow

side one another and sheer off with each.
Again, when a vessel passes withy through shallow
water, the "smalls the bottom," that is, the greater part of
the enter which refills the hole where she was, comes from
the sides. The water under the bow cannot get to the
stern quick enough, so it is piled up ahead of her, as
we see when large vessels are passing through the Sues canal; the ship's speed is reduced because she is trying to go stern first from the piled-up water ahead to the low-level water astern, and the rudder becomes more

Under these conditions, practical experiment will show that safety for two vessels only lies in a "very wide berth." LAW. HARGRAVS. Under the

### A Good Roads Suggestion

To the Editor of the SCIENTIFIC AMERICAN.

To one source or an experience assessment of the source of way to be piaced in the middle of the road, and the ba-ance of the road could be graded or built of earth or crushed rook or of such material as found most available. This stone pavement with a 2-foot rough concrete founda-tion would last for many years and prove to be cheaper in the long run. Pittsburg, Kan

#### The Reproduction of Sound

To the Editor of the Scientific American : Your Paris correspondent in a recent issue of your paper entertained your readers with the narrative of a supposedly novel method of reproducing sound, conng in forcing a current of pervious sound record. If you will look at U. S. natent No. 908,683, you will see that this principle is my invention and dates back six years or more. I inclose a ecord such as I used at that time

Philadelphia, Pa.

#### The Gyroscopic Action in Aeroplanes

the Editor of the SCIENTIFIC AMERICAN: The theory of the correspondent in the April 20th number of your paper, regarding the tendency of a certain flying machine to turn to the left, seems to agree with that I advanced in the March 9th number, but in the interest of truth I would like to say that we are both probably wrong. The solution given by "Canadian Subscriber" in 'the March 2d number is undoubtedly the correct one.

#### Mr. Turnbull on the Center of Pressure in Aeropianes

the Editor of the SCIENTIFIC AMER

In your issue of May 18th, 1912, there is an article describing "The New Elifel Aerodynamic Laboratory at Auteuil," and in it M. Elifel is credited with a discovery,

Autous," and in it M. SHIPE IS GROUND WITH A REPORT OF CONCERNING WHICH A SHIPE AND A SHIP rear portion of the plane a reverse or upward curve, the rear portion of the plane a reverse or upward curve, the movement of the center of pressure is reversed. In other words, when the angle of attack is diminished, the center of pressure travels forward, and only travels backward when the angle of attack is increased. This is a result of great posterior importance, as it means that he having planes with a reverse curvature, a considerable degree of inherent longitudinal stability is obtained. For exam-ple, if a machine in flight endously tends to dire, the diminishing of the angle of attack will cause the omier of, pressure to move forward, and this will give a stabilizing stimulation of the disperse of the contraction of the outer of, crimined, this backward movement of the contra-cinated, this hackward movement of the contract of pre-sums, will tend to right the machine and cot allow it to construct on an angle."

of the great on angle."

W, in an action published in the Physical Review in

A Company of the second

rch, 1937 (and reprinted in the Scientific Amer SMENT of January 30th, 1900) I described the sent of the center of pressure with five different SCHPLEMENT types of planes, and drew most particular attention to inherent longitudinal stability that could be obtained by the use of the double curvature type (No. IV in my article) having eancave front and convex rear portion (on the under side).

(on the under side). In fact, my scatter of pressure curves, my results and deductions are passistally identical to those of fifted ided above, and obtained patents in the United States. Great Britain, France, and Canada on the "type IV" without the states, and consider the presentation of the presentation of the state of the st

cal questions, it is only fair to state that, concerning the longitudinal stability of the doubly curved surface, my results antedated those of Eiffel by fully five years, as can pseults antedated those of Eirel by JMMP JMC be very easily verified by consulting the references already W. R. TURNBULL.

#### A Proposed Solution of the Compulsory License Problem

To the Editor of the SCIENTIFIC AMERICA.

A number of writers are expressing their disapproval of the compulsory license provision of the patent bill now being considered in Washington.

Could not most of this opposition be appeased if the bill were changed to apply to the purchaser of a patent, and not to the original inventor?

In this way any conflict with the Constitution would a avoided, and the direct object of the authors of the bill be avoided, as just as certainly realized.

The pigeon-holing of patents is not wholly practised

sons of self-preservation or self-defense, as some ıld have us believe.

Unquestionably, a vast amount of lawful and beneficial competition is suppressed by this means.

Chicago, Ili.

C. W. Eisenmann

[We fear that the suggestion, while good in intention, impracticable The practice of employing dummy directors for corporations shows how easy it would be to circumvent any such law as that proposed. The invencircumvent any such law as that proposed. The inven-tor would simply be used as a tool by his more powerful e.-Editor.]

#### Conserving the Atmosphere

To the Editor of the SCIENTIFIC AMERICAN

While the rapid destruction of our forests and exhaustion of our roal supplies are indeed questions of the utter-most seriousness, I cannot agree with your correspondent, Mr. Thorington Chase (whose letter was published in your issue of May 18th) that the "conservation" of our atmosphere is a matter to cause us the least concern.

amongenes as anter to cause us the rear contern.

True it is that the wonderful increase in the world's
industrial sotivities during the past hundred years, entailing the burning of enormous and rapidy increasing
quantities of cosl and other fuels, results in throwing off into our atmosphere vast and constantly increasing quantities of carbon dioxide, which, if it were not in some way titles of carron dioxide, which, if it were not in some way, removed from the air, would in time render human life upon this earth impossible. But just here is where the beautiful balance of nature comes in; for as we increase the burden of earbon dioxide in the atmosphere, we se growth of plant life, which absorbs the ide, "digests" out the carbon, and returns carbon dioxide. the pure oxygen to the sir. In other words, the more carbon dioxide there is in the sir, the more rapid and luxuriant will plant growth become, which in turn will return more oxygen to the air. Therefore the only result of artificially increasing the production of carbon dioxide is to stimulate plant growth, and is thus on the whole beneficial to the human race. And further than this, it is not the slowly growing forest trees that rare the most efficient purifiers of the atmosphere, but the more rapidly growing annual plants upon which we depend for our food

supply. When your corre ient speaks of the "unc millions" of tons of oxygen which are discarded in size from our blast furnaces as fixed oxygen, he apparently from our blast furnaces as fixed oxygen, he apparently forgets thigh any oxygen that gross into the size does not come from the atmosphere, but from the iron ore itself, come from the atmosphere, but from the iron ore itself, where it has already been "fixed" by nature. Practically where it has already been "fixed" by nature. Practically all our enamental production of from is from one which are oxides of iron, containing more fixed oxygen than the resulting size. Therefore the reduction of such ores tends mather to increase than to decrease the burden or oxygen in the air. True, it comes from the turnes stack as earbon dientide, but only to be eventually freed from

oxypen in the sir. True, it comes from the turnace seams as carbon sicusise, but only to be eventually freed from its earlage by plant life.

I would like very much to know upon what information your cosmonposident bases his statement that "aviators have notional inexplainable absence of available oxygen in have national inexplainable absence of available oxygen in the upper starts of the atmosphere." The presence of an excess of earthean electric in the atmosphere could have earthing to de with each a condition, as earbon dioxide is heavier than air, and naturally would lie close to the ground. Of course, the amount of oxygen per ouble yard doorsmess as we assend, in the same proportion that the density of the air decreases, but this is surely not Philadelphia, Pa E J D Coxe.

#### Compromise Plan for Upbuilding Our Merchant Marine

To the Editor of the SCIENTIFIC AMERIC Though many views on the subject of the merchant marine have been discussed in the SCIENTIFIC AMERICAN, there is one which I have not seen there, and which I

desire to present. re seem to be three well-defined plans which have

been advanced as possible methods of solution of this great economic question. These are ship subsidies, preferential duties, and free ships. Each plan has its merits and demerits, and our problem is to find, if possi-ble, a plan embodying the merits of each system with as few as possible of the defects.

Ship subsidies are distasteful to the American sense of justice, and since subsidies cannot be general, they must constitute more or less of a monopoly. Because of this, and because of the opportunity for graft afforded by direct povernment assistance to private enterprise, ship subsidies would encounter too much opposition to b applicable.

The chief opposition to preferential duties is, that they would excite similar duties in other countries; but sin nearly all governments have some form of public pronearly all governments have some form of public pro-tection already, there should be no reason why. Ameroac could not do likewise. Another objection is that with preferential duties foreign ablies would not be able to compete with the Americans. This is due to Congres-man Sulzer's advocacy of a five per cent difference in duties repardless of difference in cost of transportation. The mean course of the contraction of the properties of the contraction of the contr

For many years our factories have been protected by a olicy of laying such a duty on imported articles that he difference in cost of production at home and abroad is nullified by the tax paid on foreign goods. Under this system our factories have prospered until they are able to do without the tariff. If our merchant marine needs protection, why not protect it in the same way? It is agreed that for various causes, most of them temporary, agreed that for various causes, most of them temporary, it costs more to transport goods under the American than under a foreign flag. This is the economic cause which has runed the American merchant marine. To rebuild our merchant marine, we must remove this cause. The best way to do this is to make the difference in duties best way to do this is to make the difference in duties between goods brought in American and foreign bottoms such that for every commodity and overy voyage it will just compensate the difference in cost of transportation. This will enable American vossels to compete with the ships of all other nations in voyages between American and foreign ports. Such a system of preferential duties, regulated by a board similar to the Tariff Board, would place our merchant marine in a position to compete with the world, while yet preserving that healthy competition

which is necessary to any enterprise

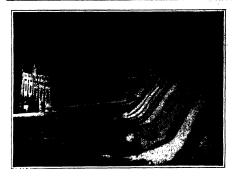
It has been pointed out that with all our shippards working to their full capsorty, it would take twenty years working to their fun especiely, it would take twenty years to construct sufficient vessels to carry our trade. Then for a few years some of our slips must be built in foreign yards or transferred from foreign registry. Our problem then is to find the most satisfactory method of admitting foreign-built ships to American registry. The free-ship plan would admit foreign-built vessels owned by Ameri-cans to registry without any stipulation as to condition and with no fees. This would force our yards to com-pete with the oldest and most efficient yards of Europe at a time when they are least able to stand it. Such a method would mevitably lead to the practical annihilation of our shipbuilding industry Manifestly then free ships are impossible. Then let us find a method which is satisfactory

It costs less to build a ship abroad than it does at it cousts sees to build a simp abroad than it does at home. This is due to cheaper labor, cheaper materials, and better management. If it costs less to build a ship abroad than it does at home, our shipyards cannot com-pete on a free and equal basis. Then why not apply those same principles of protection which have been so successful in stimulating our manufacturing industries?
Why not lay a tax on the American registration of foreign-built vessels which will just compensate for the difference in cost of production at home and abroad Under such a system of protection, controlled by the same board which is suggested to regulate our preferential duties, our shipvards would be stimulated by healthful competition without being forced out of business by an economic factor beyond their control. This system would automatically cease when the shippards of America to need it--- when the cost of production at home and abroad is equalized

abroad is equalized With the experience which we have had in protecting our factories, it would seem that the application of the same principles to our maritime problems should at least receive careful consideration. Any action which the Government takes on this most important subject must ome as the echo of the thought of the people, and we can have no action until the people have considered the quertion from all sides.

W ARNOLD HORMER.

### SCIENTIFIC AMERICAN



Lienfoss power station

Pactories at Sasheim.

### A Mammoth Norwegian Power Plant

#### Telemarken's Great Industry

N ORWAY has entered the ranks of the countries which are devoted to huge industries. Throughout the country there is evident a feverish ambition and energy toward being up and doing. Great new factories are being built and Norway's finous old water-fails ( Poss'') are being humanosed for counselful use Largest and most imposing of all, in this connection, are the enterprises which derive their power from the plant at Rickan, the Immense Industrial works which is between Movand and Hitterdalsound

in the course of the hast year, principally at the lutthattve of Mr. Eyde, general director, a number of water-power plants have spring up in Norway. Among these are the plants at Tyses, Boilefons, Ammingfons, Lieutons, Svaleigfons and Righamfons. These plants are to serve electro-technical science and industry, and the harmesolage of the waterfalls may be said to mark a turning point in the economic development of the country.

The last three of the above mentioned was the last three polymbras. Starlefors, Lienforson, Lienforson, and Diakanfoss, are all built exclusively of the maintacturing of sultpeter. Nors weathn sultpeter, as it is called, in distinction from Chill sultpeter, Chill, as the well known, bus hitherto from which this highest chill, as the well known, bus hitherto beam the only local known, bus hitherto beam the only of the control fertilities in the countries of critical controls.

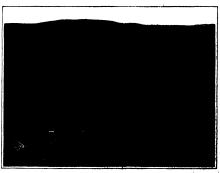
Of the three plants Mithanfose be the higgest and the most Impressed re. With the 145,000 horse-sower, it is one of the world's great lower plants. Not even the plants which are occurred an Michan how so powerful and extendiva a system When the other plant. Higher No. 2, is completed an additional 125,000 horse-power will be obtained, so that the power utilized here will be 270,000 horse-power which is more than half of the combined power that once sufficed for all of Norwa's huthorities put forether in 1000, 43;

553 753 horse-power. This is the world-framous. Rjukunfoss of Varway, the power of which has thus at last less in heracesed. The lage "Ket-fic" structed under the falls, from which the water tose perpendicularly into the art, and from which the old "food" sent its powerful bases often out over the valley in an everise-thig monotonous hum, for how almost earlierly dry, and not a sound is to be board. Where the old artificial Marieti, framous in mass and of Advince almost "hung" down from the side of the mountain, there is now to be found a broad wagen road running into and

in order to supply permanent waterpower the year round, the Moswater situated in the mountains has been walled in and dammed up. Not less than 28,250 million cubit feet can here be kept back and collected when the snow thaws in the springtime, and the waters from the mountains rush down toward the valley. In this way the river Manua, which forms the outlet for the waters of Moswater, throughout the eatire year, can be made to flow along with a velocity equal to 1,600 cubic feet per second, and the power station in this way is enabled to furnish always the same amount of energy to the factory.

Moswater is, without exception, the greatest water reservoir in Europe, and in the entire world it is ex-

Pipe lines running from reservoir dam 870 feet to power station.



Rjukan power station with pipe fine.

celled only by the mighty Assuan dam over the Nile, in Egypt.

About 6.2 miles below Moswater, and 1.0 miles above the old Rjukanfoss, at Rkarafoss, the entrance to the power station Sikarafosdamen is situated. Here commences the 8-mile long tunnel. One huge full rusbes downward, with a number of smaller falls sugmenting it in its course, and the tunnel runs along the mountain side slightly leaning inward, until it winds up in an open beain about 3,610 feet wide and 40.2 feet deep,

blasted out of the mountain. From this the water is taken and carried through teu conduits about 5 feet in diameter, down to the turbines in the power station called Highan Power Plant No. 1—dropping in their course about 950 feet perpendicularly.

If the machinery in the power station is to be stopped, the penatocks are closed, whereby the water is liberated out over the mountain-side. Nearly 1,840 feet vertically measured, the water falls down before it reaches the river at the bottom of the valley. It is the "new" so-called Rjukanfoss which is thus being artificially created through technical skill and human ingenuity—a fall even more impressive than was the old Rjukanfoss.

From the power station the water is once more led into the tunnel, situated in the mountain-side, and carried about 3 miles downward to the other power plant, Rjukan Nower Plant No. 2. Is incomplete, the water from Rjukan No. 1 continues to fall 328 feet perpendicularly downward to the river, at the bottom of the valley.

Each of the turbines in the power station represents 14,500 horse-power. This is one of the most gigantic water systems of its kind in the world. The turbines are coupled directly to the generators. It is this machinery which furnishes through conduits to the factory the electrical current which runs them.

Between the power station attuated at Venark and the saltpeter factory at Seahedm is about three miles. Above, at the station, not much is to be seen of the five to atx thousand people who have moved into the valley; for the service necessary for the plants is comparatively small—only about 40 to 50 men being required.

If, however, we follow the development downward into the narrow valley, we soon encounter at a few miles the new town called Sasheim.

cause ocasions. The power conduit in the factory enters it through the "furnace house" so-called. Beere the electric furnaces are located, party erected by Birkeland-Eyda and party of German construction. In these furnaces great electric flames bein, and six is forced into them with great velocity.

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big depending in his waver, required, because the dispuse which are liberated from the dispuse with a temperature of several hundred degrees Centigrade must be cooled shell subjected to a protonged chestical process, before being converted into states acid.

chemical process, before being converted into states acid.

This specifies takes place in the follow-ing sensings: 25% but gaues are carried through the freeboxes and bollers. The team withic thereby is produced is ground utilized as motive power for pumps, locomotives, etc., and for the further manufacturing of the product. The most impo ing feature in the entire manufacturing process is, however, the great absorption towers, in which the gases are converted through water into nitric acid. These colossal towers are built of granite, they ered, about twenty-three es and over sixty-six feet high. With in the tower, which has a floor area of 75,350 square feet and a height of about ninety feet, stand no less than 32 huge granite towers, besides many additional iron towers and machines. The tower proper is so large that the royal palace which stands in the royal park at Chris s, could be placed within it.

The satipater is manufactured by a process through which the nitric acid is ied over limestone, which in this way is ied over limestone, which in this way is decouposed. The decomposition is there after saturated with live steam from the above-needlood coolers, until the complete mass becomes a solid, which thereupon is powdered and packed into barrois ready for shipment.

The factory has its own mechanics' workshop, and, of course, a barrel factory, which last named can produce upward of 6,000 barrels in 24 hours.

On the other side of the river lies the town of Sanheim itself. It has about 5.000 inhabitants, and will, presumably, in the course of a few years, when the other great plant, Rjukan No. 2, has been completed, grow to more than twice its present number of inhabitants. The commany has invested heavily in the town. modernizing it in every respect, and it makes throughout a solid and comfortable impression. The houses are for one, two, and four families. Of late "Own Home" es have been also built, for which the company supplies easy loans to its work-men, engineers, etc. Water pipes are in-stalled throughout in the new houses, also laundry and modern water closets. Tn the same way modern streets and roads have been built with my-to-date sewers. Electric light is, of course, installed everywhere.

On the same side as the factory, just below it, lies Sanhotz astlurost station. For shipment of groods to and from the factory the company has built its own electric standard gage railroad, all the way from Notodden and up to the ferry connection, Rajip ferry, so called, over the beautiful Tim Lake, where the railroad cars are transported across directly on the ferry. The railroad is 28.8 shiele sng, shad the ferry connection over Tim Lake is separable to the ferry. The railroad is 28.8 shiele sng, shad the ferry connection over Tim Lake is about 22 miles. The Tim Lake is requirable by a dam called Timoedammen The Tim River is dammed un through The Tim River is dammed un through

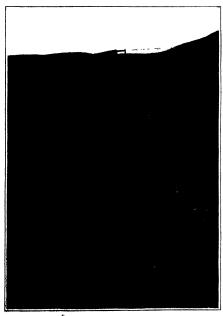
Amp aum enver it notames up turuspille the magnificent fiveslifes, making a large sheet of water, which now it called Kloumannst Lake. Earlies after the dan, deep down at the old friest hotton, the large Stweigton power station, which meets is 45 (Allo becomposer in a colonal power conduit to Notodden. This plant is comparatively the hisspent in the world of its bind. On the read to Kjegiden 15,000 horse-power is brought from Liestone significant plant in the same conduit and carried by Kjegiden down to the factories of Notodden, where salt-justice is with manufactoried. A Notodden the product

is shipped to the company's huge warehouse and shipping point, Mensizad, down by Skienselven. When in the 'course of a few years—as it is reasonable to presume—the predent canal at Skien, Notodden, is widned, the see-going ships will be able to go straight up to Notoddea, and it will, without a doubt, not be long before all the other waterfails in Telemarken are harcessed for industrial use as well.

In Norway are to be found many dormant natural riches, which, however, hitherto have been considered too poor or of too small a yield to be able to take up



Thirty-Two Aluminium cables leading to the factories at Sanheim.



Towers for aluminium cables.

the competition with those of a similar nature in other countries. Through the development of electro-technical ackness of later years, the cheap motive power which the waterfalls of Norway have supplied, will undoubledly eachbe her in many directions to take up the competition with the old industrial countries. One must, flowwere, not lose sight of the fact, as is often does, they at its not alone the motive power which plays a doministic and deedding part in the industrial development of a country; other increase and the internal analysis, among which are shirtlying with the industrial development of a country; other increase and the similar analysis, among which are shirtlying the similar analysis among which are shirtlying the similar analysis and shirtly analysis.

facilities and cost, freight, labor conditions, taxes to state and community, etc. These very often are just as important as the first. It is, therefore, of vital importance that the country should endeavor to create for its new industries that are trying to get a permanent foothold there, as good and chesp transportation and similar accommodations and attractive labor conditions as possible. Hogard must also be had for the people who make their energy part of the enter prizes, identifying themselves with the works. If this is done, without a doubt, before long the great

 without a doubt, before long the great plants in Vestfjordsdaten will be followed by others of equal magnitude and as important for the country.

### Academic Freedom in the Orient

wonderful contrast with our mo distinguished sents of education, E Azhar, the celebrated university of Cairo the greatest and oldest high school of the Mohammedan world, recently passed the thousandth year of its existence. But unlike our universities, of which the sys-tematic management is always a brilliant phase of their progress, this educational focus of the Orient is also a remarkable example of a really unrestricted, perfect academic freedom. All tribes, peoples and races are represented in the body of students embraced by the university, the number of the last never being the same. but fluctuating between 2,000 and 3,000. This extraordinary alma mater, it must be said, can awaken and retain the affec tion and loyalty of students with greater ease than any other university, for in very numerous instances the object of the wed disciples of her particular cycle sciences who enter the consecrated halls of El Azhar is not merely to attend the lectures, their residence and work be-tween the walls of the university being really a portrayal of their whole lives. Even the barbers have a permanent station in the great vestibule, so that these special students do not need to leave the university in any event.

The heart of the institution is the great court which is splendidly paved. Upon it scores of little doors open and loggias and balustrades in great number abound As an architectural entity it is a picture-sque oriental masterpiece. Those students who with least case can pay for a small cell in the university incur no expense for the spaces on which they sleep uncroofs of the great open social hall. There rooms of the great open social and, there is no fee for matriculation, and there is no obligation to pass any examination. Unsubjected to tests and omitting any stated conclusion of study there go forth from El Azhar orators inwyers, physicians and poets, many a man among them having lived for decadewithin the precincts of this aima mater The teachers and professors receive no salary or other strict compensation, they live on the voluntary dole and presents of their pupils, on the meager price of private instruction, and on the fees they receive for copying old books and manuscripts There is no faculty that calls the professors, no authority that appoints them, every pupit of the university can establish himself after a few years of study independently as a teacher in the halls of El Azhar, begin to lecture and to teach the truth as he knows it or be-lieves he knows it. And under such apparent laxity of administration the great university continues an existence that is by no means precarious. In the opinion of its staunch friends, of its benefit and of the young men who are waiting to throng to its halls, its authority and im portance are more obvious and brilliant

and impressive now than ever before.

The real and logally of the students who are leaving it at frequent and frequent intervals are incomparable, and are the source of a later invalry, in business and perfordedom, or such strangeness, productions keepings and perstatency as must assumd the over dental student who may be quite unfamiliar with orien tal customs and who is graduated only in africt accordance with the sheer system that prevails during an atdoous curriculum, and is, therefore, much more evenly quitiped for frank competition.

### Henri Poincaré

#### The Passing of a Great Mathematician and Philosopher

By J. W. N. Sullivan

THE nineteenth century has been aprly called the It is not that that century sursed all others in the magnitude of its discoveries, but that scientific results and scientific methods were then, for the first time, brought home to the minds of the people. The general interest taken in the theory of evolution, consequent on the publication of the "Origin of Species," extended to other branches of science. One great cause which contributed to the general spread of scientific ideas at that time was the part taken by some of the foremost scientific men in presenting their results in a form devoid of technicalities, and in such way as to be readily understood by the average man. Since that day we have had innumerable popular ex-positions of every branch of science. Indeed, the writing of popular accounts of scientific discoveries has almost taken rank as a distinct profession. Such writers usually confine their efforts to explaining re positive discoveries. But of late years something far more interesting than any isolated discov-ery, however wonderful, has taken place. We

ery, however wonderful, has taken place. We are in the midst of a general criticism of scientific procedure, and of the value of scientific procedure, and of the value of scientific results. The scientific has proven uneasy. He is no longer sure of the very foundations on which be whole vast superstructure of modern science is creeted. To present these intrinsic questions, these subtle and far-reaching bases, in a form which renders them readily understood of the vaccage man, requires the hand of a moster

In the domain of mathematics and physics, at any rate, the master appeared. In the late II Poincaré we had a gentius of the first order, a man whose accomplishments in his chosens sphere earned him a foremost place among his contemporaries. By many competent authorities he was considered to have been the greatest mathematician of our day. It would be impossible in the space at our disposal to give an adequate account of Poincaré's work in mathematics, mathematics, mathematics, and dynamical natronomy. We here wish to call attention to his three books. "The Value of Science," "Science and Hypothesis," and "Science and Method."

These works are, in a large measure, critical rather than expositors. They contain the profound reflections of their distinguished author on questions of the first importance, and yet are written with such clearness and charm of style that they may be read with pleasure and profit by any ordinary thinking may

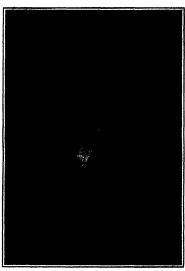
Take, for Instance, mathematics, the most impocable of the seleuces. Policient was that its very existence appears paradoxical. We start from definitions and axioms, and deduce comequences while are also intelly necessary results of our premises. We introduce no fresh facts we make no appeal to experiment. How then can we discover new truths? It would seem that all mathematical reasoning must reduce to a ginantic tautology, and that all the mathematic at theorems which fill so amany imposing works are all theorems which fill so amany imposing works are

dimply various ways of saying that A is A

Poincaré analyzes this paradox and shows that the nery resource of mathematical reasoning, and that which itone makes it valuable, is the principle of mathematial induction. This great principle affirms that if a theorem is true of the number 1, and if we can funher assert that, being true for the number n, it is true for n+1, when we have proved that the theorem is true for all integer numbers. This principle is, in one way, a kind of short cut it enables us to dispense with the labor of verifying the theorem for every parcular case, and is the fundamental characteristic of nathematical towarding. It alone makes generalizators results

Again, we all know what great changes have occurred a our way of looking at the fundamental concepts of country. Since Lobechevski and Riemann have shown is that it is possible to construct perfectly looked and westered geometries quite unlike Euclide, the question has arrisen in some minks which geometry is true? For instance, according to Euclide's geometry the three metric angles of a triangle are together qualit to two right angles; in according to Lobachevski (they are less han two right angles, and according to Riemann they are restered than two right angles, and according to Riemann they are greater than two right angles, and these differences merass with the area of the triangle. Suppose then we effect some astronomical measurements by measuring the angles of the very large triangle formed by the

diameter of the earth's orbit and the lines joining its extreme points to a fixed wars. If we make our measurements with sufficient accuracy, it would seem that we should be in a position to answer the question, which geometry is true! Poincaré shows us that this is not the case. In making our measurements we have implicitly assumed that light is propagated to straight lines. If we found that the sum of our measured angles was not equal to two right angles, we should not change our geometry, we should simply concluding light in the sum of the straight likes. We should do this because it would be more convenient. This is the key-note to Poincaré's treatment of this subject. It is meaningless to talk about the truth of geometric theorems. It is as meaningless as to talk about the truth of the metric system. The theorems are necessary consequences of the preliminary hypotheses, and these hypotheses are erbitrary. We have selected those we have in preference to others because



HENRI POINCARE

they most nearly and most simply accord with the observed facts relating to solid bodies and are, there-

We have not space here to give an account of Poincaré's profound remarks on the subjects of space and time, those old bugbenes of metaphysics. Suffice it to say that he treats all such questions with unrivated insight and ability. On the subject-matter of physics proper his views are equally striking and original. He its out that in the accepted theory of matter, the electron theory. Newton's third law, asserting the quality of action and reaction, does not hold unless we assume a reaction on the ether which gives the necescompensation. This fact is of fundamental importance. On analyzing our concept of energy, one of the most important concepts in the whole range of physics, he succeeds in showing that except in a few comparatively simple cases it is very hard to define, and that a general definition simply reduces to saying that in any physical phenomenon there is something which remains constant. This notion of energy, in facbelongs to a class of hypotheses which are distinguished the fact that they can never be contradicted by experiment. Then there are two classes of hypotheses la science—those which may be submitted to the test of experiment and judged by their behavior under that test, and those which serve us as general control principles, but which are outside the range of exp ment. Poincaré illustrates this difference very ci

and an interesting example, taken from biology, has been sives by Prof. Royce in his introduction to the American translation of "Liftypothiese et a Seissee."
This activenely inadequate aketch of the seldied material popular expositions will, we hope, induce the reader to make the acquaturance of the volumes mentioned. He will find himself amply repetit for his trouble

Like many other great men. Poincaré manifested he extraordinary powers at a very safry ace. He was born in Nancy in 1985, the son of a Twench physician. As a boy he was ruther delicite, and distinctioned for the society of other boys of his age. He seems to have been a vary engaging child and wonderfully intolligent. He was trained first as an expineer, and received his doctorate in mathematics at the age of twenty-dress Plut he had very early given proof of his extraordinary mathematical powers. It is related that he never took notes of the tectures which he attended, nor did he notes of the tectures which he attended, nor did he

ever read the copies of the lectures which were distributed among the students. He simply made a mental note of the results given by the made a mental note of the results given by the professor, and when called upon, could always stipply a proof of his own. Like many other people who are in the hubit of induling in in-tense mantal concentration, he did very peculiar He was very fond of walking engaged in thinking out his problems, and had a habit of "fiddling" with something in his hand. This was so well known at the college where he was a student that the professor gave him bunch of keys to carry as he paced the corridors in meditation. On one occasion he was discovered on one of the principal streets of Paris carrying a large new wicker-work basket in his hund. He suddenly became alive to the fact, and retracing his steps, found that he had nsciously purloined the basket from a store ad passed some time previously. It is also related that he was once found packing his trunk with the bed-linen of the house where he was a guest under the impression that he was packing his handkerchiefs. The histories of other great mathematicians, such as Gauss and age, show that intense mental concentre tion is often accompanied by this peculiar state of oblivion to the external world. In fact, at times, as in the case of Mir Isaac Newton, it has given rise to temporary suspicious regarding r sanit). Poincaré was a well-known figure in Parisian society, and was by no means the retired mathematical recluse of popular imagina-tion. He was a member of the French Academy of Literature, an extraordinary honor for cientific man, and a member of a great number of scientific societies in various countries. His published works embrace nearly every branch of pure and applied mathematics. His work in cal astronomy is of great value. Among other things, he has made contributions to the famous problem of three bodies which are of the first importance. In general function theory

the first importance. In general function theory he has created a new type of functions. Together with Klein he has spylled some of the concepts of the new geometries to the integration of linear differential equations, and he has greatly helped to develop the branch of mathematics known as Analysis Situs.

It is of the greatest interest to know the way in which the mind of a great man works. On this point Poincaré has given us some most illuminating information. There appear to be three stages in the solution of a problem: first, a period of intense mental effort, usually usesuccessful; secondly, a complete mental rest from that particular problem; and thirty, a uniden revelation of the solution, followed by a period of consistence of the solution, to the proofs of the answer revealed. We say conscious effort, because Poincaré himself believes that the period of apparent mental rest is in restity a period of intense activity, the activity of the subconnections self.

The first period of intense mental activity seems analogous to setting a number of things in motion, which then proceed to form combinations among themselves. The question why the correct combination, and nother, is presented to the conscious mind, does not permit of any very satisfactory answer. But it is significant that the right combination is the conseint most appeals to the seatherin eners of the mathematicians, glid there is probably a deep relation between times, and there is probably a deep relation between times, and there is notable probably a feet probably a feet probable as the correlations of a theorem and its mathematical.



A seedling being helped by betrowed roots.



The seedling when first inarched on the nurse plant.



The seedling soon feeds from the nurse plant.



All the vigor of the older plant is sent into the single shoot of the seedling.

### Hurrying Nature

A New Method by Which Trees That Fruited in Eight Years are Made to Bear in Two

By William Atherton Du Puy

AMETHOD of hurrying trees to their period of fruithing has been discovered at the Government hothouses at Washington. There the new who juggle with iting plants and make them do things of which nature never dreamed, have recently succeeded in diverting their period of trees that were large and atrong, souding that may contrain through the version of spindling seedlings and thereby caused those seedlings to do in two years what ordinarily would have taken eight

Take for example the finger lime of Australia Italia an exceedingly rare plant. Three years ago it had not a representative in America. About that time some-body sent three seeds of the finger lime to the Depart ment of Agriculture. These were planted immediately and all grew. Being the seedlings were of the immortal and the selectific growers knew that it would require sight years for the finger lime to come into bearing under normal conditions. Eight years is a long time to with in a reperiment.

At just this period the new method of diverting the vigor of other trees into a seedling was in the course vigor of other trees into a seedling was in the course of being established. The process is known as "tuncelage". One of the funcer line seedlings was inarched upon upon a vigorous two-year-old lemon tree. All the strength of that tree was diverted into the slender strength of that tree was diverted into the slender shoot. In two years it had ripened its fruit and the selectative were subject of its quality. Further, they were supplied with additional seed with which to start new generations of blanch.

start new generations of plants.

This shortening of the fruiting time of plants is of

Insatinable value to the releasified developer of fruits. The breeding of fruits is one of the most facelanting of the modern sciences, and the results that are just now being obtained read like the remances of conjurers. The greatest stumbling block in the way of the working out of these modern miracles has been the length of time required in producing successable guestions of a given plant. It has often happened that a scientist has died before he has accomplished the end for which he has act out. For the court is one fourth, and the probabilities are that results, will be, in the sour-just generation, and unjusticed a hundred on a

The insigh is a compitation in this way: The section is grown to the two of less three or four

And add Ver

weeks. It is a weak little plant of but four or six leaves Nature has stipulated that many years must use before it comes to mutrity, blossoms and bears fruit. Under the inarch process this stripling is taken up with a ball of earth about its roots sufficient to maintain its life for a few weeks. The whole is transcred to a stalwart vigorous tree of a kindred species. This tree may be two or three years old. Its roots are deen, It is supplying sustemance for a top that is a hundred those as large as the seedling.

This is known as the name tree. The nonter bark is scraped from the side of the name tree a foot above he ground. The outer bark is likewise acrased from the sectling. The two wounds are bound together with soft cloth bands. The ball of dirt on the root of the sectling is bound to the side of the name tree in two or three weeks the plants have grown together. The dirt from the roots of the sectling may be removed. It is now drawing fits visor from the name tree. Eventually its roots are ent off monothly below the point of union. The name tree has taken the little orphan plant unto itself.

But this is not the end. After the union is thor oughly established the plant juggler cuts the top off the great vigorous surse tree. Then is all the nourlabment that was going into its top discrete to the singlesmall stem. Then do its roots which have been estabishing tempores deep in the soil for years send their vigor into the small seedling. The result is such growth as nature never knew. The trig has such an abundance of nourishment that it vents some of it in fruiting before its time. And this early fruit is strong and vigorous, showing the utmost possibilities of the tree There are scores of experiments which the Departs

There are scores of experiments which the bepartment of Agriculture has had under way for many years, that have been worked through the slow cycle of generations of plants, but may now be hurried by means of the new method. There is the citrange, for instance. The citrange is a hybrid fruit It was obtained through that scientific development in truit breeding that has been going on for the insid decade and which has as its basis the cross-fertilization of kindred fruits.

The orange, the grapefruit, the lemon, the tangerine, even that orangen all belong to the same tamily Their relation is so close that they may be cross user. Plains may be cross there by shaking the pollen from the flower of one into that of the other. The process in nature is brought about by bese carrying the pollen from one flower to the other. So the scientist, whething to cross certain varieties, prevents the fertilization of the diowers by the bees by putting paper haps over the experiment, he removes the bags, shakes the pollen from the flowers of the one plant into those of the other and puts back the paper large. The seeds that result from the flowers of the one plant into those of the other and puts back the paper large. The seeds that result from these flowers will be a cross between the two plants used in the experiment. They may be planted and the hybrid fruit grown. This is

just what has been done just what has been done between the ordinary orange and the mock orange The mock orange cold resistant plant. It will grow as far north The great as New York difficulty with the oranges and citrous fruits in general is that they can grow only in communities not visited by frost So the scientists have sought to cross the coldresistant branch of the orange family with the branch that produces the best fruit and thus secure a plant that will produce a good fruit and will also grow in a cold climate.

Now a hybrid seed so obtained requires, under the methods of unsided nature, the accustomed eight years to bear fruit. A wait of that length of time is necessary before the experimenter knows

(Concluded on page 86)



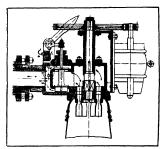
A sume plant with its arms full of seedlings, shortening the fruiting time.



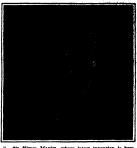
Australian finger lime, the first of its kind ever grown in America, was hurried to fruiting by means of the inarch.

# Inventions New and Interesting

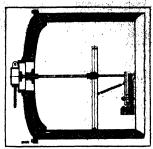
Simple Patent Law; Patent Office News; Notes on Trademarks



1—Vertical section of vibration producer. The disk colarge at a inform speed so at to give a fonce of constant pitch. The steam enters the central pivot, peases through the balanced valve and expese through the expanding nouries into the small send of the trumpet. The balanced valve decision of the valve makes and breaks the chocing and closing of the valve makes and breaks the chocing as



.—Sir Hiram Mazim, whose latest invostion is hordescribed in his own words. Delivors that it here sible to avoid such disasters as the sinking of the "Titanic" by causing obstructions in the path of a vessel to reflect vibrations produced on the vessel test? The reflected vibrations are caused to so that?



—Apparatus for converting the insudible waves or his eithe into sudible counds. Atmospheric vibre itous course a disphragm to vibrate like a drusbead. Is moving it makes and breaks electric circuits and osuses bells of various sizes to ring. The pressure of air in front of the disphragm greature.

# Preventing Collisions at Sea

A Mechanical Application of the Bat's Sixth Sense

By Sir Hiram Maxim

Title wreek of the "Ittania" was a severe and panful shock to us all, many of us lost frends and acquaintances by this dreadful catastrophe. I asked myself: "Has Senence reached the end of its tether? Is there no possible means of avoiding such a deplorable loss of life and property? Thousands of ships have been lost by running sabore in a fog, bundreds by collisions with other ships or with incherge, nearly all resulting in great loss of life and property."

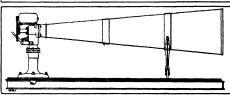
At the end of four hours it occurred to me that ships could be provided with what might be appropriately called a sixth sense, that would detect large objects in their immediate vieinity without the aid of a scarchlight

Much has been said, first and last, by the unscientific of the advantages of a searchlight Collisions as a rule take place in a fox, and a scarchlight is worse than useless even in a light haze, because it illuminates the haze, making all objects beyond absolutely invisible

Nome have even suggested that a steam whoste or arren might be employed that would periodically give off an extremely powerful sound, that is, a vertiable blast, and a steam of the steam

whatsoever Experimenters are fully agreed that the bat possesses what might very properly be called a sixth sense, and that it is able to pursue and capture small insects in the dark under conditions in which eves would!

This article is abstracted from a volume published by Cassell & Company, Ltd. For lack of space at has been impossible to present in full the author's ingenious arguments for suppossing hird a bat really can project vibrations and guide himself by their reflections from surrounding objects under conditions that render the use of the eyes impossible. Moreover, we should like to use the arguments mode substantiated by experiments conducted by some competent modern biologist. Bir Hiram's apparatus, however, is based on sound mechanical and physical principles and send no biological analogue to consince one hast it is sound. The reader is reflect to Bir Hiram's book for a complete description of the instruments described and of their operation. We can gue her only the barest outsine—Euron.



4—Side elevation of the complete apparatus The trumpet can be turned in any For short-distance work a smaller, bell-mouthed trumpet is simpleyed.



5.-ySpecimens of records that might be received from the editors.

be of little or no use. It is a very curious fact that, notwithstanding that the organ of the stath sense is the most conspication of the stath sense is the most conspication organ possessed by the bat, none of our scientific men have discovered it. It was cridently too apparent to be observed, and reminds one of Christian in "Pligtim's Progress" who was digging in the muck for a corown when the crown in question was directly over his head and very compisous. In many cases, the organ that gives the bat the sixth sense is spread all over its face. In the vampire bat the organ is on the tip of the nose; it steades up in the air, and is called the "shield," but in most of the small bate that catch insects on the wing, we find two little leaves, not unlike the wings of the insect that it pursues, standing up just in front of the ears. Others have the sensitive spots located on other parts of the fosce.

parts of the face.

Let us see now what takes place, and
what it is that enables the bat to fly about
through all manner of obstructions without
touching anything, after the manner of a
swallow. What enables it to pursue a fly
or a bestle in a degree of darkness which
renders eyes useless?

renders eyes useless?

In the bast that feed on swiftly flying insects, we find that this small organ is about the shape and size of the wing of the insect on which it feeds. The beat of the insect on which it feeds. The beat of the insect was give is communicated to this ergan and enables the bat to follow the insect and select it without seeding it. This is very simple and easily understead, because the insect itself produces certain atmospheric without so which the little leaves in front of the basic sea respond, but when we come to instinante things that give off no vibrations of themselves, how does the bat know of their presence? How

give off no vibrations of themselves, how does the bat know of their presence? How is is able to judge of their character? If he already been shown that the wings of the bat are cartenedy sensitive and very well provided with cerves, and the same, is used of the various eights on the face; if some, all of these are intimately near comes, all of these are intimately near house of the various eights on the face; if nearly with the companion of the companion of heads of the bat. When a but they do not hard of the head. When a but they single in their destroses, the best of its vierge single rout is settled of plaintenance are weives after the

the considered as sound, the second of the s And the second section is a second se n. The the to their source of origin. what is ead set the "threatons or impulses and they are reduced back and received by the sensitive organs which form a part of the line of the bat. The extremely deli-cate nature of the bat's wings, together with the sensitiveness of its organ of the sittle sense, exables it to judge the distance to say object by the lapse of time between the sensitive transition. iding out and the receiving of the waves, because it takes some time, some smotional part of a second, for a wave to travel from the bat's wings to the object turn to the bat's face.

and return to the bat's face.

We know that this is the mechanism that gives to the bat what is practically a sixth sense. We know it must be true because it cannot be otherwise. That the bat possesses this power is completely beyond dis-pute, and this is the only way that it can be adcomplished. But all bets do not possess this organ; the fruit-esting bats that do not fly about in total darkness have large s this organ, although eyes and never possess this organ, although in some cases we find the rudimentary reof the organ which they have inherited from their early ancestors, the same

we have inherited the Darwin tip.

The energy employed by the bat is certainly not more than one-thousandth part of a horse-power, but it serves the bat's se perfectly well.

ppose, now, that we construct an vibrations of about the same frequency as those produced by the bat, but instead of simal amount of energy the infinit using the inuntesimal amount of energy employed by the bat, we use two or three hundred horse-power—that is, we send out waves that have an amplitude and energy at least three hundred thousand times as at least three numered thousand times as great as those sent out by the bat. These vibrations, although of great energy, will not be audible to our ears, but they will shake up and agitate light objects for a con-siderable distance, and will travel at least siderable distance, and win travel at least twenty miles, so that they could be received and recorded by a mitable apparatus at that distance, and would be able to travel at least five miles and send back to the ship a reflected echo that would be strong enough to be detected.

The quantity of steam required would not be very great, because the valve would d very often, and when open not be opened very orten, and when open would not remain open more than a second at a time; therefore, the total amount of steam required while signaling was actually going on would certainly not excee

The apparatus could also be used for communicating with other ships by giving off long and short blasts representing the dots and dashes of the Morse system.

In providing a ship with a sixth sense, we have to consider three distinct devices. one for producing and sending out the necessary waves, one for receiving the reflected waves and making them audible by ringing bells, and another apparatus

oy ringing beus, and anoncer apparation for recording the amplitude of the waves. For producing the vibrations of waves, I prefer to use a modified form of a siren, the disk being rotated at a suitable speed by a motor of some kind, preferably an by a motor of some kind, preservely an electric motor. I prefer to use a very high pressure of steam, to have all the parts large and strong, and to produce about fourteen or fifteen vibrations per ourteen or fifteen vibrations per These will not come within the range of the human ear, consequently they cannot be considered as sound, and as they are of great amplitude and no as flay are of great amplitude and gover-they are able to travel over great dis-tantes; and when they come in contact with a body, the waves are reflected back to the ship in the same manner that sound would be indicated back. But this other would save be amblisted to the human sax. histolore, provide en apparatus which his he considered as an artificial car posticied with a large displaragm tight-listing over a dram-shaped cylinder, the presented that the atmospheric to distinguish the same on both sides, sentiments of any air black. It is, the same on both sides, the same sides of the s

in response to the waves of the echo, and its vibrations are made to open and close certain electrical circuits which ring close certain electrical circuits which ring a series of behin of various sizes. If, for example, the object is very small or at a very great distance from the ship, a very small bell rings, while a large object at a distance of two miles would ring a larger bell, and a very large object a still larger bell. This apparatus gives an audible notice if anything is ahead of the

The other apparatus is similar, but instead of ringing a bell it produces a dia-gram of the disturbances in the air—that gram or the disturbances in the air—that is, when there is no noise except that due to the action of the ship or the sea waves, a wavy line is produced; but whenever a way line is produced, out whenever the vibrations sent out by the vibrator strike an object and return, the wavy line on the paper becomes very much increased in amplitude so as to be easily observed, and the distance that the obje the ship can be measured by the length of the paper strip between the giving of of the vibrations and the receiving of the echo; therefore, the distance can be deter-mined with a considerable degree of nicety. and the size of the object may be deter-mined by the amplitude of the waves that return

Very extensive experiments were conducted about forty years ago by Prof Tyndall at the South Foreland. He found

about from port to starboard. It should be very firmly secured to the deck, and connected with a high-pressure boiler by odinected with a ingra-pressure boner by a three-inch pipe. A straightway valve should be placed in the pipe near the boiler, and means should be taken to prevent accumulation of water in the pipe leading to the apparatus.

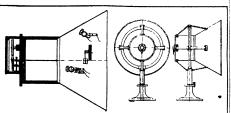
leading to the apparatus.

If the sea were perfectly clear, the blasts sent out would be recorded at the very instant of their production, but no echo would be returned other than that due to the waves of the sea, which would produce a zigzag line of small amplitude; but if there should happon to be an object of any considerable size at a distance no or any considerable size at a instance no greater than two or three miles, the zig-zag line on the paper would be changed, the amplitude of the waves would be greater and would be very noticeable. To make sure, the blasts could be repeated ral times; and then, if the should be always the same, it would indicate the presence of some object, and the length of paper between the primary blast and the echo would indicate the distance that the object was from the

ship. It might be so arranged inch of paper represented a mile. The receiving instruments can be placed turned in the same direction that the sirer is turned, and there may be as many of them as desirable.

It might be so arranged that one

but it serves the bat's interest of that time it was reflected by a powerful of the working of the many that we construct an interest of the working ill produce atmospheric sound that was reflected back from a ship it has same frequency as the bath, but instead of that snow, rain, and fog were very unfavoring the coast of Ireland, the echo would be compared to the coast of Ireland, the echo would be compared to the coast of Ireland, the echo would be coast



Apparatus for recording the frequer and amplitude of the atmospheric vib stons. A red is attached to the cen of the diaphragm, which carries a p

experiments he found that such was not a distance of at least ten miles the case. The most unfavorable weather for sound is when the sun is shining brightly and when the air is optically perfectly clear. Under these conditions, we have heated air rising up from the earth, and cooler air descending: this produces a kind of a glimmer in which it is very diffikind of a gimmer in which it is very dim-cult to sight a gun at long range with any degree of exactness, but my apparatus would not be needed in this kind of weather. It is well known that the air around a

large iceberg is extremely cold—in fact, so cold that certain scientific men have thought that it might be possible to detect the presence of icebergs by the use of a delicate thermometer; but the cold ar does not extend far enough around the does not extend tar enough around the isoberg to make this practical. Cold air, however, lends itself admirably to the use of my apparatus, because the air itself about the isoberg, being of a different density from the surrounding air, acts as a reflector returning the vibrations to the

ship.
In Prof. Tyndall's experiments I find

In Prof. Tyndall's experiments I find the following:

"In the experiments at the Bouth Foreland, not only was it preved that the acoustic clouds stopped the sound, but that the sounds which had been refused transmission were sent back by reflection." The appearants for groduleng the atmospheric vibrations should be placed well, forward on the main deck er in any other position where it can be turned

able to the travel of sound, but in his be sufficiently strong to show itself over

To many it will doubtless appear very difficult, even on the verge of the impos sible, to reveal the presence of objects at sea by simply sending out atmospheric vibrations and receiving the echo of the same. One might ask, how can it be possible to judge of the size, distance. and character of the object by the echo! If, however, we make a careful study of the matter, we shall find, if we send out a powerful blast of sound like a deep musical note, that it will travel a long distance, and if it strikes any object of considerable size, it will send back a reflection or echo. Sound is nothing more no less than atmospheric vibrations. If there are less than sixteen vibrations in a second of time, they are not audible to our ears we do not hear them, although we may feel them. They may be of great power and able to travel a long distance, and if they should happen to strike any object they send back an echo which, although completely inaudible to our ears, is sufficien to record itself by suitable apparatus, and the record thus made will give us a fai idea of the object struck. It will indicat its size and shape with a fair degree of accuracy; it will indicate its direction from the ship, and will also show its distance with great accuracy. It will dis-tinguish a ship from an iceberg, will show whether the object is stationary or moving, and if moving, the direction and velocity

#### The Trade-mark as a Business As By W. E. Woodward

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THE average business man has only the vaguest notion of the value of a trademark. He does not realize that it is very mark. He does not reduce that it is very often the connecting link between the producer and the ultimate consumer, that it is a symbol of good will, a langible asset with a determinable money value; that it must be chosen and appited not in a hapharard way but with a due regard for its psychologi-cal effect upon the public. Nor does he realize the importance of complying with the statutory requirements which secure to the statutory requirements which secure to him a property right in a trade-mark com-parable with the property right that an inventor acquires by taking out a patent The following is the third of a series of

articles, written by a man who is at once a trade-mark, an advertising, and a business expert, a man who has a first hand knowledge of the value of trade-marks and of the correct methods of trade-mark exploitetion. The series, which will be eventually published in book form, will include discussions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elements of a good trade-mark, and trade-mark proa good trade tection.--EDITOR.

#### The Federal Trade-mark Law. -- IIL (Continued from page 62, July 20th, 1912.)

The right to register trade-marks a limited to individuals and corporations. Under the United States law an asso-

Under the United States law an asso-cation cannot possess a trade-mark, as exclusive ownership and specufic origin are essential attributes of validity The letters "A-A. L.," meaning Anti-Adulteration Loague, were refused regis-tration as a trade-mark for four on the ground that the mark did not represent origin, but membership in an association The applicant was a voluntary associa-tion of flour manufacturers. It was held that an association cannot be the "owner" of a trade-mark within the meaning of the statute.

Some States have enacted laws pro-hibiting the unauthorized use of the labels of trade-unions and similar associations The laws are not trade-mark statutes. They are based on the broader principle of unfair business competition.

It is the general opinion, we beli trude-mark authorities that the lack of provision in our law for association trade-marks is a defect that should be remedied as soon as possible. It is a noteworthy fact that most of the other great nations

An interesting example of an associa-tion trade-mark is that of the Irish Industrial Development Association. association has a membership of about five hundred Irish manufacturers. Its use indicates that the merchandise to which it is affixed as of Irish manufacture, in other words, it is indicative of geographical origin. The Irish trade-mark has necession tered in Great Britain under the British The Irish trade-mark has been regis

An American of the name of D. B. Barrett attempted to register this mark in the United States Patent Office under his own name. This fact came to the his own name. This fact came to the attention of the Irish Industrial Development Association and some correspondence relating to the matter passed between Mr. John Redmond, the leader of the Irish National party in Parliament, and Press. dent Taft. As the law now stands, this Irish trade-mark cannot obtain in the United States the protection that regis

tration might give.

Within the last few years several American communities have adopted trademarks, or labels.

There is a genuine need for an amend-ment to the law that would give this class of marks the right of registration.

A provision of the Act of 1905 legalized

all trade-marks that had been in exclusive use by the applicant for ten years prior to the passage of the act, and this provision applies even to trade-marks of ten years' standing that, because of their character, could not be registered under the act. The wording of the act dealing with this subject is as follows:

Nothing herein shall prevent the regis tration of any mark used by the applicant or his predecessors, or by those from whom title to the trade-mark is derived, in commerce with foreign nations or as the several States, or with the Indian tribes, which was in actual and exclusive use as a trade-mark of the applicant or his predocessors from whom he derived title for ten years next preceding the passage of this act."

manufacturer cannot register a trademark and file it away with the intention of using it at some future time. A condition of validity is that the mark must not only belong to the applicant, but must be "used by him in lawful trade." An intention to use a mark is not sufficient. The use in trade must antedate the application for registration. The letter of the law is complied with if a single package of the goods with the trade-mark ed for sale. affixed is expos

Those who intend to adopt trade-marks should keep in mind that the use of a trade-mark is limited strictly to one class of merchandise, which must be the class

or which it has been registered.

An applicant for registration must An applicant for registration must
An applicant for registration must
specify not only the general class of mermark appears to be entitled to registrachandise in connection with which he
intends to use his trade-mark, but must
least can be preciseledly the articles in that. Patent Office. This publication must be
class upon which he has used the trademark he seeks to register. class upon which he has used the trade-mark he seeks to register

For instance, a manufacturer who might For instance, a manufacturer who might apply for the registration of "Pendennis," as a trade-mark for smoking tobacco— to select a word at random—would find that it would not be satisfactory to the Patent Office to state in his application that the mark was being used in connection with Class 17-"Tobacco Products. He would be required to state that his mark was being used on "smoking tobacco." After registration had been grunted the Patent Office would not register another "Pendennis" trade-mark in that class of merchandise to be used on cigars, for instance, for another applicant. Nor would the first registrant be obliged to apply for a new registration if he should to extend the use of his trade-mark to eigars, or chowing tobacco, or any other tobacco product. The law would protect him in the use of the mark for all articles of that class but the rules of the Patent Office require applicants to give full particulars not only as to class of merchandise but the specific articles on which the mark has been used

result of the principle of trade-mark practice which limits the use of a mark well as in the same name being used as registered mark for unrelated articles.

The name "Pompeian," for instance, is used as a trade-mark for a face cream and also for wire netting for window screens; "Republic" is used for automoscreens; "Republic" is used for automo-bile tires as well as several other articles in different classes, "Packard" for pianos and automobiles, and there is an "Ideal" hair-brush and an "Ideal" fountain pen.

The law directs that the owner of a registered trade-mark affix, print or im-press upon such trade-mark wherever it or m close enough proximity to is used, or in close enough proximity to it to be easily seen, the words: "Regis-tered in U.S. Patent Office," or the shorter abbreviated form, viz., "Reg. U.S. Patent Off." The trade-mark of Baker's cocos—the Baker chocolate girl—show how this should be done

If this notification is not used in con-nection with the trade-mark, the owner of the mark, in infringement proceedings against an unauthorized user, cannot colleot damages unless he can prove that he gave the other party formal notice, and that the unauthorized use of the mark continued after the notice.

A trade-mark is not merely an advertising symbol It is an essential of trade-mark validity that the mark be affixed to the goods A device, or word, or phrase, or picture that is used only in circulars, advertisements, or on signs or letter-heads is not a trade-mark and cannot be protected under the trade-mark laws. (It should be stated here that the unauthorized use by another than the owner of such a device or wording may sometimes be pro under the common law-the law of unfair

under the common new-the law or unner business competition.)

A trade-mark may be printed, pasted, written, stamped, stanciled, branded, sewed or woven upon the article with which it is used. In cases where it is not practicable to affix the mark upon the merchandis

RULES OF THE PATENT OFFICE.

We have not the space here to go into a detailed description of the proc a detailed description of the procedure of the Patent Office in considering trade-mark applications. This procedure, es-pecially in cases where there is some doubt as to the validity of the mark, is highly complicated, and can be foll successfully only by an attorney experi-enced in trade-mark practice.

The rules of the Patent Office require

The rules of the Patent Omee require applications for registration of trade-marks to be made in a certain conventional form. A drawing of the mark, of a certain specified size, must be submitted with the application. Proofs of the mark, as actually used, must also be forwarded as exhibits in the case.

registration.

The purpose of the publication of the mark in the Official Gazette is to allow opposition from any one who thinks its registration would conflict with his rights. Opposing an application is technically called an "opposition." An opposition serves to delay registration until the examiner in charge of interfe siders the evidence submitted.

Under certain conditions, rejected appli-cations may, on appeal, be taken up to the Commissioner of Patents

The number of rejected applications is

very large. Under the law of 1905 the total number of applications up to May, 1912, was 62,500.

The total number of registrations under the law is around 42,000. This means that more than 20,000 applications have been rejected in seven years. In other words, about two out of every three appli-cations pass the gauntlet of Patent Office scrutiny, interference and opposition, and

Many of the defective applications fail because of a lack of competent advice in devising the proposed trade-marks, as well as because of inexperience in procuting the applications.

(To be contin

### Notes for Inventors

Wanted: A Collar Pastening Improve ment.—Have you ever tugged at the tab and fretted yourself into a perspiration before finally getting it fastened? If so, yo If so, you will realize there is a field for an impro ment either in the collar itself to make the fastening easier, or in the collar button, or a substitute for such button which will enable the convenient fastening of the collar and securely hold it when once fastened. Attempts have been made by at least one collar-maker to obviate the necessity buttoning a collar.

A Device That Loads and Unloads Mot-Trucks.—There is considerable activity at the present time in devices for loading and unloading motor trucks through the aid of removable bodies which may be loaded and then applied to the truck. Ralph L. Mor gan of Worcester, Mass., has secured a pat ent, No. 1,030,320, for a motor truck apparatus in which the bed of the truck in- Commissioner says that no case has been clines or curves downwardly at one ead so cited and he knew of hone where a patent it may readily adjust under a body suitably had been refused or had invalid solely on supported at the desired elevation and a the ground of delay in fling the applications is provided having a slip for sup- platform is provided having a slip for sup- justified in the real or body, the slip being so by the inventors and he distinguished from formed that the truck may be run into it oness where absordpoints it effect is single and the bod of the truck being slightly itsual or constructive had been supplicated. paratus in which the bed of the truck in-

gher than the top of the allp so th truck with the crate upon it may be run into the slip and the crate will be supported on the truck over the skip. Then when the crate or body is fastened at its rear end by a chain or the like, the truck may run out the slip.

Women Invent there are learned women just as there are women warriors; but they are seldom or never inventors. It is not clear whether he never inventors. It is not clear whether he intended to exclude from the class of inventors, women generally or only "very learned" women. Certainly women have invented in many fields and it is not seem how learning can decrease their ability in such direction, for another writer tells us that invention is activity of such and is. that invention is activity of mind and is a sharpening of the spiritual sight, to discern hidden aptitudes. Certainly this spiritual hidden aptitudes. Certainly this spaight should not be dimmed by learn

#### Local Notes

A Trade-mark Builing.—In the case of Burton Medicine Company v. United Drug Company, Assistant Commissioner Ten-nant has held that where an opposition to the registration of a trademark is filed by a registrant, a cross bill saking for the cancellation of the opposer's registration will not be admitted.

The Case of a Fereign Trade-mark Applicant.—In the trade-mark case of Ross & Brothers v. The Louis Bergdoll Company v. The Greenway Brewing Company, Assistant-Commissioner Billings ha

mean:
"Where a loreigner applies for registration for
a trade-mark subsequent to the registration by a
citizen of this country of the same mark, that in
order to be entitled to an interference with such
registration the foreign applicant must make a
prima facte showing of use in this country."

A Welsbach Incandescent Filament Decision.—The Court of Appeals of the District of Columbia has affirmed the decision of the Commissioner of Patents hold-ing certain claims in a Welsbach applicaunpatentable in view of the price The filament presented in the application comprised a stable electrically conducting mixture of osmium and one of the described oxides, and the Court, in affirming the de-cision of the Commissioner, said that other ream or the Commissioner, said that other references to prior patents were given, but it thought that the Edison patent furnished a complete anticipation of the claims in-

The Supreme Court and Improvements.

--History shows that the Supreme Court has followed invention and improvements even in its decisions of constitutional ques tions. While telegraphy was unknown at the time the Constitution was written and the time the Constitution was written as the word tited was not in existence, the Supreme Court brought the term word within the meaning or within the scope of "commerce" as used in the Constitution and Chief Justice Waite thus explained the exension of the power:

lonzion of the power:
"The powers thus granted are not confined the instrumentalities of commerce. Incomo or in use when the Constitution was adopted, but they keep pace with the progress of the country and adapt themselves to the new development of time and circumstances. They extend from the horse with its rider to the stage couch, free the saling yeard to the steamhost, from the test of the control of the

Delay of Application After Reduction to Practice.—In Walker v. Lederer, Mr. Commissioner Moore has decided that Where W. reduced the invention to practice prior to the earliest date of invention claimed by L., that W. did not forfeit his right to a patent in favor of L. by delay in right to a patent in ravor or L. by delay in fling his application where there was no suppression or concealment of the inves-tion." In the course of his decision, the Commissioner says that no case has been

CHRISTIF PAR petions are large with the inventor Advertising Des

BRIA.—I. Resembly to Appear.

Bronx, N. T., M. T. This invention provides a resiliant belt for treasure mounted there to maintain an approximately constant pressure on the premote at the nately con-



means for the beit to increase the period of its service; and provides guide members for the beit, and incembers being attached to the brunears. The adventage in the use of the beit is that the vanishing of the garment is held in its correct position upon the wanger's body under all normal conditions. The en-garings above a freat view of a fragment of trousers provided with a belt and pocket stress.

Perceasing to Avention.

ARMIAL PROFELLER—M. L. Rectory, 252
P. O. Reiting, Ranses City, Mo. The investment of the control of

#### Of Conemi Interes

PROPELIER—A. CARROA BE IOS RIOS, care of La Aleman Lemparans Electrics, Monte 211 Havana, Cobs. This Investion relates more particularly to a pepoller comprising an elongated, tapered hub, and an elongated, tapered but, and an elongated, tapered sorter blade, of varying radius, for purposes of propulsion in connection with marked vessels, asroplaces, etc., which provides means by which agentive silp may be minimized.

by which begative slip may be minimized. CIGAR BOX.—J. J. PLANCO, care of CIGAR BOX.—J. J. PLANCO, care of Suare & Co., 432 E. 886 St., Manhattan, N This invention relates to a clear box and object is to provide a cigar box in which old of peculiar configuration may be packed position separate from one another so as prevent lajery to the same. Means prevent configuration may be carefully withdrawn.

#### Mardware and To

MAGAZINE HAMMER—O. J. A. 8 Picdmont, Mo. The purpose of this invise to provide an improved hammer what simple and durable in construction, amanipulated with such hand and arrange quickly discharging nails, tacks or like



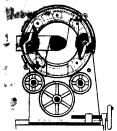
MAGAZINE HAMMER

enser one by one, for setting the discharged fustomer at the desired place on the object into which the fustomer is to be driven, and into which the fustomer is to be driven, and quirting the operator to touch or handle the fustomer, and every no chand down for mental-lating the object. The negroving shows a no-tional defe elevation of the humber. The fa-vantor's address is care of C. W. Chandler, Greenville, Mo.

Oreserville, Mc.

BOUTER FLANK.—B. ATLOR, 1212 B. 106th
Rt., Cleveland, Othio. This invention provides
a router plans seeke with supplemental eve-tors and resters, the mass being planed appo-site one another in syntestic position gas also considered in vertical position gas to get proves of different widths. Then bit inclinating are located in revent of the self-nary resize bit, which may be finen used in-out and channel on the provided proving made for the pre-graving made for the pre- strangensing mini-allyming proving or loss districts again.

An investigation of the control of t



THE WEAPPING AND UNWRAPPING MACHINE

ing mechanism for the shattle provides for aredding the need of a filter for gap in the shattle; a shattle carries a plurality of bobias and takes wrapper apoply therefor; mean previde for reaconing or renewing the bobbias and supply for the shattle; also for controlling or reverse the operation thereof, and means to sawind wrappers from the tire and reverse direction of the wrapplas. The oursaving shows a vertical section of the invention. APPARATUS FOR EXCURSION AND POLIBITING FLOORS—FA. MCKLY, over of Massion & Harr, Kingston, Januica, W. 1 compliated without the necessity of the operator hisselfing or shooping, and effective political gap passers may be exerted upon the political.

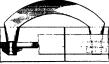


BEYICE FOR SCHUBBING AND POLISHING FLOORS.

ing brush, during its manipulation by the operator. As shown in the accompanying engraving the platform rests upon the Score. The property of the property back and forth, as shown in dotted lines, thus imparting respective that the property of the proper

Frime Motion and Their Accessories.
ACTA CHESINF FOR OIL WELL APPLAATUR—4. W. LENDAR and H. E. BROWN.
CARE Of G. L. Roberts. 215 Water St. Pittsburgh, Pa. This investion relates to chitches to be applied to mealinery adopted to be drived.
The complete of a speam engine, the cythics of which has bedd replaced by one by the interest combustion type, with the bearing of the extended zigid relationship to the engine cylinder on a pivoted support to prevent fracture of harr by the working of the augies on its bed, relatively to the bearing.

PLOAT RAIL LOCK.—I. W. CLEMNORS, 53 Bloomfield St. Hobsken, N. J. This inventors of the control of the control



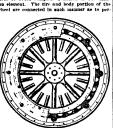
FLOAT BAIL LOCK

affixed to the rails on bridge or wharf and quickly attached to the rails on a car final. These objects are attained by pivoting a yoke to a rail or bridge or wharf, which yoke has its free opposite end adapted to engage an elongated slot in a corresponding aligned rail on the float. The engraving abows a pinn view looking down upon adjacent meeting and of contacting rails

WATEE CAROUREL...A. C. Batt, 486 E 188th St. Bronz. N. Y. More particularly this larention involves an amesment device made up of a suitable basin in which a number of receptacles, such as tuins, are suitably positioned, means being provided whereby these receptacles may be moved around the basin, a turning movement being imparted to them at the same time.

Pertaining to Vehicles.

VEHICLE WHEREL—W. W. REVELS. St. And drews, Waides, N. Y. This wheel has a right tire and the conter structure is supported by interposed resident members. The resilient numbers are constructed and arranged in unit form to avoid complete defaution of the cushous element. The tire and body portion of the wheel are connected in such number as to per wheel are connected in such number as to per the property of the proper



VEHICLE WHEEL.

nit a critical depress of the three and loop protten, and to correctly that the term of the tire and loop portion, and to correctly that the same the tire constructor prevents skidding. The invention provides a tire constructed from relatively this artipa of non-resilient material having disposed therein rings constructed of authority that the construction of authority that the construction of means for preventing were non the bull and bearing sleeve of wheel mountings, wherein the wheel is journated on the sain. All cent when the journated on the sain. All cent was the construction of a construction of a construction of the construction of t



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#### The Why and Wherefore of the Muller and Cut-out By Harold Whiting Slausen

ENGINEERS have been laboring for many cities and to Lyears to produce the silent car. Months of constant experiment have been spent in of constant to evolve a quiet transmission or forward train of gears, and only by the use of special bearings and accuracy and detail to the thousandth part of an inch have the results as exemplified in the mod-

rn automobile been obtained.
But of course the noisiest part of a co is the motor, and anyone who has attended d or a track race will bear witness to the fact that the power plant announces its importance in no uncertain terms when And for good reason does an unmuffled and healthy motor make itself heard, for it is a tremendous power that is harnessed in the cylinders and made to expend its energy in foreing down the pistons. Each on in each cylinder g neratos a nee sure approximating 250 pounds on each square inch of piston surface. This means that, in a 50 horse-power, four-cylinder motor, a force of nearly three tons is concentrated on each piston with every igni-tion of the charge in that particular cylinder. Or, if we consider the gas engine as a whole, a total of over 5,000 tons is exerted on the pistons each minute that te motor runs at normal speed These are imposing figures, and it may

be wondered why such a gasoline motor develops only 50 horse-power, but it must be remembered that this force is not appled continuously but that it is divided into a number of three-ton "hammer blows" of short duration. After the first "impact" the pressure decreases until, at the end of the stroke, it is scarcely sufficient to overcome the friction of the motor. But though the three-ton energy of each explosion is soon expended, there is still a onsiderable force, amounting to three or four times the pressure of the atmosphere. four times the pressure of the atmosphere, that must be disposed of at the bottom of the stroke. This is the exhaust, and when this pressure is suddenly turned loose into the open air by the quick motion "ear-splitting" is a mild term to apply to the unmuffled exhaust.

Now to many of us, the term "muffle" may convey the idea of to choke, or cover up, and this, in a sense, is what the muffled does to the noise of the explosion. But with a high band and say, "You shall not escape," but rather does it lead the gas to expend its energy by does this by providing a chamber in which the exhaust gas may be expanded before reaching the outside air. If the exhaust reaching the outside air. It the exhaust were carried through a series of expansion chambers, it would have become quite meek and subdued by the time it was discharged, for as it expands, so its energy -and consequent noise-making abilityis expended. But in order to save space and weight, many mufflers are in the form and weight, many numers are in the form of a single expansion chamber provided with a sories of "baffle plates," or disks, containing a number of perforations through which the gas passes, and thus the exhaust expends most of its energy in these and is rendered practically harm-less by the time it has reached the place where it could make any impression on the

Many motorists consider the word 'muffler" to be eynonymous with "back-pressure," and as they know that this latter term means a resistance to the pasage of the exhaust gases and a consequent sage of the exhaust gases and a consequent reduction in the power developed by the motor, some of them have come to look upon the muffler as a power-absorbing device. In consequence of this belief, the uncorrect an consequence or this belief, the out-out button.

But because the cut-out has been abused allowed to exape directly into the open is no indication that it does not possess air without first passing through the nuff-value when preparity restricted. It may fire, has become one of the most used—be made to serve as an effective variance and abused—executories of the car. Its signal for the average positions which we have been been been so flagment, in fact, that "move" more quickly at the sound of their

names prohibiting its use, and it is looked upon as the one device that is setting at maught the efforts of the designers and builders toward the production of the silent car.

It may be that the old type of muffler, provided with many obstructions to the passage of the exhaust gases, produced an appreciable amount of back-pressure that absorbed some of the power developed by absorbed some of the power developed by the motor. The power plant of the modern car, however, is equipped with a muffler of a type that, by means of especially-shaped passages and expansion chambers, enables the speed of the out-rushing spa-to be increased so that the resistance of to be increased so that the rematance of the muffler may be nearly overcome and the amount of back pressure will be reduced to very small figures. In fact, tests that have w cently been made on several motor when run both with and without the muffle in place have shown some surprisi sults. These tests demonstrated that, for all practical purposes, the muffler produced no diminution in the power developed by On the contrary, some of the tests showed that the motor produced slightly more power at 700 and 800 revolutions per minute with the muffler in place than the case when this "noise reducer" was removed. At speeds of 900 and 1,000 revolutions per minute there was but little difference noticeable; but at speeds at which the motor began to deliver its maxiwhich the motor began to deliver its maximum power, a slight loss could be detected with the muffler in place. At 1,400 or 1,500 revolutions per minute this power loss amounted to slightly over five per

dynamometer without the muffler in place.

The mufflers used in these tests showed back-pressures varying from zero to three and five pounds per square inch. Conse-quently it is possible that an old muffler, of poor design and clogged with soot and carbon, may absorb slightly over ten pe cent of the maximum power of the motor or a vaive, a sharp report is bound to occur, But the interesting feature of the motor, for the force in question is really the "tall ments lies in the fact that they show the end" of the explosion that has but just power loss caused by the muffler to occur taken place in the valunder. Let two only when the motor is operating at high thousand of these "tall end"—each of speeds and delivering its maximum energy, which is pretty vagorous by itself—ceur But even the smallest car is capable of in a minute, and it will be realized why a tataining speeds well over this to the unremainder. capacity of the motor should never required in cities or towns. Consequer required in either of towns. Consequently, owner it is only in the open country in which the number maximum speed can be attained, or in the But seen to a steep hill in which the full thaust power of the motor is required, that the light of the steep of the motor is required, that the steep of the motor is required, that the steep of the ste gained by the elimination of the muffler is problematical, and is more theoretical that practical The sound of the unmuffled ex hausts at the rear of the car gives the im-pression of increased power, but the effecis more hypnotic than actual and it is quite possible that the car could climb that hill or attain the same speed on that trait nill or accan the same speed on that straightaway as easily with the motor operating quietly as it could with the explosions making themselves evident in a stream of Gailing-gun reports trailing

dynamome

behind the machine. coming the macaine.

But granting that a steep hill can be climbed faster or a higher speed on the level can be attained with the muffier cut out, what are we to think of those drivers of the high-powered cars who open drivers of the high-powered asrs who open the out-out without provocation when driving through the city at a pace which could not possibly require more than a third of the power capacity of the motor? It can only be the desire to attract attention that prompts such a procedure, for the slightest movement of the throttle or spark lever will produce more power than would the most strenuous pressure on the out-out button



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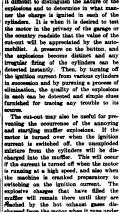
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NOTICE TO CONTENTION OF STATES OF ST

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charged from the motor when it runs under its own power.

These hot gases will ignite the charge in the muffler, and the violent explosions—which will at least startle bystanders, if they do not week the nufflerwill result. If the out-out had been opened whenever the motor was turned with the ignition current "dead," these explosive gases would have been discharged into the open sir, and no muffler explosion could

result when the out-out was again closed. The dividing line between the use and abuse of the muffler out-out is not difficult to draw by those who have at heart the reputation of the motor car. It does seem to be difficult, however, to induce many drivers to follow that dividing line, and as "the sins of the few must be borne by the many," the present sweeping prohibitory legislation has resulted. When every driver has passed that stage in which he resembles a full with a new toy that he likes to "show off," the muffler cut-out will be a safe and valuable accessory for all motor cars. In its present status, however, the diadvantages arising from its abuse so outweigh the munor advantages that its proper use possesses, that many of even the most enthusiastic automobilists are heartily in favor of laws such as those recently passed in New York and other progressive cities.

### "Heart Stopping"

(Ontested from page 72)
To prove this, he proposes to be placed in a box. a foot of sand covering the horton. His mouth, nontrile and sare will be filled with cotton wool and his eyes bandaged, to prevent the sand from entering his system. Thus mand will be plied upon him until he is covered by at least eighteen inches of it, weighing a ton; after remaining in this position for a quarter of an hour he will be extracted alive and well. All of which reminds one of Stavenous's "Master of Ballandous of Stavenous's "Master of Ballandous Page 12 and 12 an

trac."
This athlete, interesting as he is from more than one viewpoint got his idea of stopping his heart by reading of East Indian "fakirs." The press agent concludes with the pleasant assurance that here is another 'wonder of the world."

I should like to set down certain observations regarding this phenomenon, which ward I use advisedly as messing "appearance," a term not necessarily consonant with "reality."

It is wrong to state that such muscle manipulation as that theseribed has never before been degened possible in medical history. Sandow, for example, in his exinfections was able to make his muscles this muscles that the best his muscles this muscles that the best his muscles this muscles that the best his muscles that the sandown the best his muscles that the best his muscles that the sandown his sandown his



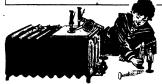
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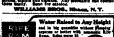


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in muscle manipulation by mental concen-tration and exercise; the thing requires nothing more wonderful than persi in practice during years. Many of the justly praised feats seen in the circus and candeville are developed in this way, singleness of purpose and hard work being the only requisites. Beyond this there is nothing marvelous or approaching the miraculous in them. All muscular action is dominated by the nervous system; and the nervous system has its throne in the brain; where mind most supremely mani fests itself By willing it, and by constant practice, one can do wonders with hi muscular system, as he can do with other parts of his body

If anyone is at a loss for an ambition in life, he may by persistent concentration and practice, so manipulate his great too (or for that matter any other part of his body) as to increase its size out of all normal proportion Johannes Mülle 1838, stated (and this is sound paych) Johannes Müller, in to-day) that "The idea of a particular motion determines a current of nervous action toward the necessary muscles, and gives rise to the motion."

Next, as to the photograph demonstrating the decided concavity of the abdominal wall. Of course the abdominal muscles are here contracted and not the stomach. Protrusion of the abdomen is stomach possible, through exercise of the mind. The literature of the outré in medicine contains such instances. In medical practice physicians sometimes meet women who have 'phantom tumors' of the abdo-But these phantom tumors disapyour when the patient is made to compre end that she is mistaken, or should obsession persist, these "tumors" are dissipated, and the abdomen returns to nor-mal, under anesthesia. There are many performers who can remain under wate several minutes "Odiva," it is claime can do this at least four minutes, which is not miraculous, but only mildly unusual. As to being buried alive for fifteen minutes, I can only repeat here that I have seen a record of the promise of such feat, but not of its fulfilment.
Statements of wonders done in the East

make most entrancing roma can have no standing in the court of

And now about that "heart-stopping." The muscles of the body are voluntary and involuntary; the former are mainly under the control of the brain and spinal rord, the latter mainly under the control of the sympathetic system. But not altogether in either case. For generally some cerebro-spinal filaments will find their way into sympathetic ganglia; and vice

Many voluntary movements become also involuntary; I will to take a walk; but as soon as I have got started my legs do this for me involuntarily while my mind is occupied with other things. The heart is enervated from both the cerebro-spinal system (the vagus nerve) and the sympathetic system. The normal heart beat is 72 per minute, a patient fearing he has a fatal disease cuters the consultation room with a pulse of 130; having been as sured there is no such maindy, or any occasion for such fear, his pulse beat, on leaving, has returned to normal. Drugs again, such as mustarin and opium, will very decidedly slow the heart beat.

It seems possible then, by concentrat-ing the will upon the heart, to quicken or slow its pulsations. But I know of case where the function of the heart can thus be really stopped, and certainly I do not believe the idea will hold in medical science, that this can be done for twenty seconds

The slieged proof in the case before us appears to be based upon the physician having put his car to the athlete's chest and listening for twenty seconds, watch in hand, with the result that he heard no beat. We need not question either the athlete's or the physician's good faith. But such failure to hear the heart beat

The stathoscope is much niere sectionate than the unsided ear, and the phenendoscore still more so; the sphygmomete applied to the wrist might trace a beat (which would certainly indi heart beat), though no beat could be elicited over the heart. I do not learn that such instruments were used. And that such instruments were used. And even if, by means of the most delicate apparatus, the heart pulsation could not be appreciated, this would still not necessarily argue an absolutely non-functionat Patients are moribund, coma tose, for hours, with no appreciable heart beat, and yet they survive; in all that time there must have been some degree of cardiac action.

And if there were absolutely no heart best what would become of the blood? It annot enter the arteries, because it has to be pumped by the heart into the arter lungs with inevitable asphyxia, and there would have to be engorged veins. But of these things no evidence whatever is

#### **Hurrying Nature**

whether success or failure has crown his efforts. Then, possibly, he finds that one plant in a hundred has yielded something that is promising. In such cre there is great divergence of type. only by selecting certain individual which the types desired exist and seeking to accentuate these types, that a given fruit may be built up and established. get the desired characteristics fixed in a given plant Under the old system the time so consumed was such that seven years were required in establishing a new In the citrange two plant genera fruit. In the citrange two plant genera-tions have been grown under the old sys-tem. The fruit that has been developed will grow anywhere in the Southern States. It takes on the nature of an im-States. It takes on the nature of an im-proved lemon It will be more nearly s titute for a lemon than any other of the fruits that we now have. It is still ornamental plant and the Departme of Agriculture recommends that people living in the Southern States plant the citrange in their yards as ornamenta plants and derive the added advantage of being able to pick ripe fruit for citrangade, or for any of the purposes for which lemous are used, from their own gardens at almost any time of the year. are ten thousand people now growing the citrange trees

But had the inarch and the been in use the citrange would have been peased through eight generations instead of two by this time. The fruit would have been much more highly developed. Many fold greater results would have been already accomplished

But with the citrange develope present and the inurch discovered, there seems great opportunity in this fruit in the near future The citrange is but typical of a great number of new fruits that are just now being developed. There is the tangelo, which is a cross between the tangerine and the pomelo or grape fruit. The grapefruit is over bits many people and its skin is close fitting, making the ment hard to get at. The tangerine is over sweet and the kid-glove skin almost falls from it. It is easy to imagine the fruit that would result from this cross. By selection and combinations of the desired qualities by cross breeding the specimens, the scientists believe that will be able to establish fruit will have just the right amount of tart-ness and just the desired kind of skin. Already there are some specimens of the tangelo growing in Florida that are said to be in every way superior to the orange. With the use of the nurse plant and the march great things are expected in the next few years.

There is another application of the inarch that is just now being tested. De cate fruits such as the lemon that refu to grow except in a few spots in the very warmest of the United States, are bet inarched upon such cold resistant plants does not prove there is no beating heart, as the mock crange. It is known that it

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sooner determined. There are those who may say that prac-tically the same things may be accom-plished by the old process of budding or grafting. This is, however, not the case. Before a plant may be budded onto another stalk it must have acquired consider able age in order to produce the right sort of buds. The process of budding is most delicate and the results are in que It is vastly slower than the insrch. It is vastly more difficult. The Governmen plant growers state that any intelligent

The man who has been the moving spirit in the inarch work of the Govern-ment is George W. Oliver, who has charge of the Government hothouses at Washing-ton. Mr. Oliver, like so many of the great gardeners and agriculturists of the na-tion, is a Scotchman. The greater part of his life has, however, been spent in the United States, and for many years his has been the conseless care that has kept the temperatures right in the Govern ment hothouses for growing plants that range from the Arctic circle to the equaone plant to another is his final but is merely typical of the manner in which he works the things of the veges would seem hope for nothing short of witchery.

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the sap ceptral of plants that protects on from frost. The lemon, for instance, winter. When the weather gets suf-atly cold this sap is turned into ice and the plant is as a consequence killed. But where the lemon is insrched on the ock orange, which by nature has a say control adapted to cold climates, the story is different. When cold weather approaches the mock orange roots refuse to nd the sap into the top of the tree. refore, fails to freeze and is not killed by the cold. So it is hoped that by inarching the orange, the grapefruit, the lemon, or any other of the citrus fruits upon the sturdier, related growths farther north, the danger line may be crowd-ed into materially higher latitudes, and that even the citrus fruits of the present may be grown in a vastly wider range in the United States.

The inarch may also be extensively used in rose culture. When scientific plant growers develop a hybrid rose through this same method of cross fertiligation they have been forced to wait for years until it came into flower. Some of the most delicate blossoms grow on stalks that are also delicate and slow to develop. Such seedlings may be inarched on the stalk of some sturdy and well rooted rosebush and vigorously crowded into blos-som. Its virtues or lack of them may be

man, though entirely inexperienced, can readily accomplish the inarch, while the buffing process of budding requires the out exact scientific skill.

This transfusion of the energy of

#### The "Comm onwealth"-"New Hampshire" Collision (Concluded from page 72.) watch, all were asleep on both ships, the

crews repaired quickly and quietly to their stations, and eye-witnesses on board their stations, and eye-witnesses on loaru-each vessel state that there was no con-fusion of any kind. The "Common wealth" backed off, proceeded to her land-ing, and discharged passengers and cargo The crew of the buttleship at once set about preparations for effecting the neces eary temporary repairs to enable the yes sel to proceed to the nearest navy yas These consisted of two wooden

heads securely bolted to the ship's side-and decks and suitably braced to with and occas and matchin proced to write shand heary sees from aft if necessary. By working day and night a theroughly efficient watertight job was completed en-tirely by the vessel's crew in four work-ing days. Here again theory is home our ing days. Here again theory is borne out by penciose, showing that the modern bettleship actually in a self-cohreshed and independent, unit, capable in an extensory of scenetime were sent exclusively repaired as view extinction processing in this case of measured to the case of the A LEARNING TO THE SECOND



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More astounding than ever are the achievement the most chemist—more astounding than even Pasteur dimenses. Who would have thought that rubber—real rubber—out of turpenine, out of postores, out of coal tardifferent substances? Who would have thought, ago, that sugar, steel, flour, almost every article of would in this year nineteen hundred and twelve be made haphazard rules of thumb in a factory, but by trained armed with instruments of precision, with test tubes, and Who would have thought that even the time honored cooking would be reduced to a chemical basis and that the kitchen would become a kind of laboratory? That the of a steak or even the mere poaching of an egg would became matter of chemical concern?

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Munn & Co., Inc., 361 Broadway, New York The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are shirtly the articles around and the facts enthetarch the contributions will receive special attention. Accepted articles will be paid for at regular special rates.

The purpose of this journal is to record accu-valely, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Wanted-A Chief for the Bureau of Chemistry

ONTHS have now elapsed since Dr Wiley resigned as chief of the Bureau of Chemistry. That no successor has as yet been appointed may be attributed to the fact that it is no easy task to induce a scientist of commanding position and personality to accept an annual salary far less than the sum which he could earn in a year in private practice. Moreover, the conditions under which work is now carried on in the Bureau of Chemistry would be intoler able to any really scientific man. Selfish food manufacturers are bound to do all in their power to make official life as unbearable as possible, and the spirits that now dominate the work done by the Burens of Chemistry in passing upon the legality or illegality of the doings of food and drug manufacturers would hardly be in sympathy with a real scientific chief. cannot imagine that any self respecting scientist who has a reputation to sustain would be willing to accept the position without absolute power to reorganize the entire bureau, and to shape its investigations in such a way that its work will be respected. Yet, not until a thorough reorganization is effected, not until the old meaningless divisions of the Bureau of Chemistry are abolished, not until the rank and flie of the Bureau aronalosed, not omit the ranks and me or the variety of Chemistry realize that at last they may work with the impersonal, unbiased, open minds of chemists in a university laboratory of the highest standing, is it likely that the Bureou of Chemistry will become a traily effective and valuable institution. When that reorganization is effected it will no longer be necessary to maintain at an expense of tens of thousands of dollars per year a referee board to check up the work of the Bureau of Chemistry. As matters now stand, the Bureau of Chemistry has the lamentable distinction of being the only department of the Government that cannot stand on its own scientific feet, and that re-quires scientific supervision by another body

quires scientific supervision by another body At present wealthy dishonest food manufacturers find it no difficult risk to escape the punishment which they so richly deserve. Opposed by well meaning but incompetent employees of the Bureau of Chemistry they find it no difficult matter in Court to offset their u scientific evidence by expert testimony, which can be bought at a market price, and which is at least as good as the evidence officied by the Government. That is why the admirable Pure Food and Drugs Act is not at present as effective as it should be Not until a strong man is appointed, a man who realizes the enormous responsibility of caring for a nation's health, will that excellent piece of legislation become what it should b

dentific men naturally shrink from the kind of publicity which the reorganization and administration of the Bureau of Chemistry will bring with it. For that reason it may be necessary to appoint some four s, honest, public-spirited civilian, who is in full sympathy with the idea's and methods of scientific men

#### Interference and Aeroplane Disasters

HREE very recent accidents to aircraft have furnished food for serious reflection, and they are all the more important because we appear to be on the eve of a wide adoption of aeroplanes of or another form for military and for naval uses. In addition to this, these mishaps are likewise lessons to source to this these mistage are likewise lessons to the ariator generally. In brief, we are brought face to face with the fact that speeding aeropianes are a danger to one snother even though maneuvering at apparently safe distances.

On the 20th of June, Mile. Helene Dutrieu, while driving a monoplane at Aix-les-Bains, hit an "air hole," as the descending air current has been nick-named, and fell to the ground. Her fall, however, was checked by her machine landing on top of two other monoplanes ascending at the time, and all three of the agroplanes were thrown to the earth.

Sixteen days later, at Villacoublay, near Paris, Lieutenants Briez and Burles, both of the French army, cenants orres and surres, oon or the symbol army, wet out on a flight toward Belfort, a point on the east-ern frontier. Lieutenant Briez got the start of his fellow avintor, and had reached a height of five or six hundred feet before Lieutenant Burles overtook him. Lieutenant Burlez was traveling a hundred feet higher up and faster than his brother officer. Just after the upper monoplane swept ahead, a de ecending column of nir-undoubtedly the reaction due to the overhauling and higher monoplane struck one of the wings of Lieut, Briez's machine and destroyed its equilibrium so suddenly and forcibly that the latter aviator and his aeroplane were dashed to the earth. Lieut. Burlez was thus the innocent cause of the disaster which nearly cost his companion-in-arms his life.

It is quite probable that Mile. Dutrieu's fall may have been brought about by the aerial perturbations set up below her by the maneuvering of the two lower monoplanes—in this respect the promoting agitation coming from beneath instead of from above as in the case of Lieut. Briez's serious plunge. We do not cause of Lieut. Briez's serious plunge. We do not know what were the speeds of the two disturbing aeroplanes at Aix-less-Buins, but it is not hard to see how doubling the cause of the aerial commotion would naturally promote greater reactions, and the gravity of this under any circumstances might be augmented if the same factor of agitation occurred nearer the ground. This is broadly on the principle that a b displacement of the air, as that occasioning sound, for instance, will carry its effect higher than a similarly disturbing force exerted at greater altitude and trans mitted downward. In the case of the Burlez-Briez ecident, we are left to speculate us to what might have occurred if the lower rather than the upper monoplane had overhauled and passed onward at greater speed.

Coll) a few days ago, the Italian aviator, Guidoni, while maneuvering his hydro-aeropiane sloft in the Gulf of Spezia, drove his machine across the wake of "Imnte Alighieri," which was at that time making about twenty-three knots an hour. high speed of that battleship created such perturba-tions in the air that Guidoni's machine, aithough some distance astern, was capsized and tumbled into the water. This is especially suggestive to the naval man, because the use of the hydro-neroplane is proposed conjunction with sea-going ships as mobile laun ing and landing places for these hybrid scouts. tumble which Signor Guidoni got under auspicious con-ditions of wind and water does not prophesy favorably for the employment of aeronianes with moving v. and in more boisterous circumstances of wave and weather

But what all three of these filuminating misl emphasize is the wide zone of disturbance set up by the reactions of the air following a moving body. Model basin experiments and the influence of ships in motion have given us convincing evidence of the force of the mave given is convincing eviceize of the force of the saction created between neighboring vessels under way. Because of the denser character of the medium supporting floating ships, it is reasonable to suppose that the action of readjustment of the surrounding water is confined to a relatively restricted zone when compared with similar disturbances created in the air. And yet we know that moving craft have affected another by suction when separated several feet. Because of the compressibility and the far le density of the air, it must be pain that a flying machine—not a balloon—is drawing for support upon a much wider atmospheric zone than a similar weight borne upon the water's surface. Again, the compres-sibility of the air is a prime factor in saustaining a, heavy body in motion aloft, and the re-enjansing of this air in the wake of the aeroplane must produce perturbations which carry their influence correspond-ingly further because of the very nature of this me-Therefore, at first blush, it seems that the fiving machine in flight must be given a wider berth by another aeropiane than heretofore imagined. The on tion is, what will this impose when air caft of this sort undertake to operate in squadrons? Formations of this kind may logically follow the adoption of the ine gun.

It has been intimated by some students of this problem that the propellers of the aeroplanes were prin-cloudy responsible for these disturbances leading to the formation of falling columns of air, otherwise popularly known as "air hoise" or "air pockets." That there is good reason to doubt the entirety of this perthere is good reason to donot the entirety of this per-turbation being due to the propellers has been dis-closed by the towing tests of models in the experi-mental basin. The researches of this character have

shown propospeed suction to has declared his belief that atous factor in pr that a somewhat kindred o between the propeller of a fi bluntly against the opposing a it is contiguous to these sur ted to its greatest com the points of suspension, a the wake of these planes of the vertical agitation recent accidents anggest & T gation which might be pa art of serial navigation these casualties can not

#### The Protection of M trom L

OWHERE else do the atmosphere and fying a character as mountains, and the danger of the formidable obstacles tion of mountain observators of the Comptes Rendus, M. J. founder of the Mont Blanc of graphic description of these and some suggestions for avertin. It is a mistake to suppose that t

It is a mistake to suppose that it by smow suffices to protect from was illustrated last August, when the Society of Observatories, bull of Mont Blanc, was struck by lig results to one of its occupants. Twod, roofed with sheets of copper, vided with lightning rods. It was pris snow at the time of the disaster. T was struck in 1909, although it did metal roof. metal roof.

metal root.

The famous Janssen observatory on was repeatedly struck, although it bos lightning rods, connected by cables to few hundred feet distant. This building and was built on the snow. The effects of and was built on the spow. The effects of a were extraordinary and appalling; the m ware was frequently melted or perforated; and nuts in the walls were melted; the w charred; the metal cap of the large telesco

pierced with holes, etc.
In 1903 a guide, one Felix Boson, witn In 1903 a guac, one reak Boson, winnessed as liant electrical discharge in the form of ribbo fire which for two hours and a half continued to across the interior of the bugding, proceeding one of the cables connected with the lightning one of the cables connected with the uganing we in 1902 a ball of fire as large as a pigeon's egg a seen to move slowly across the room, then retrest a distance and explode, giving a violent sheek tell persons present. In 1907 a series of lightning stig persons present. In 1907 a sense of lightning stim-coourred one evening at nearly regular intervally, a few minutes; each stroke produced a desfeat obse and was attended by sparks like few serpest which shot through the observatory in all directions. This process continued nearly an hour. Such other renors appear to have been common at the January observatory, which must have been a far from trade

observatory, whom must have been a far from trangest place of abode for the savants who carried on histograms researches at this elevated spot. It is evident that lightning rods are entirely inable-quate to carry off the enormous discharges of mountain

In contrast to the experiences of the former Ja observatory, it is most encouraging to learn M. Vallot's own observatory, on another part of M Blane, has never once been struck by lightning, du presents and the second process of the secon bo destreas enter or any mn is observed inhan boulding, despite the presence of numerous me instruments which are not connected with the ligh rods. M. Vallot's observatory therefore forms a v ble object lesson to anyons who is contemplating erection of a mountain observatory.

Danger in Metal Wine Vessels.—A note of warning regard to the use of metal utensits for the measuring serving, or holding of wine is sounded in the Mena Vesscote by M. L. Mathieu. In general only copy plated copper, or silver should be permitted in rooms, cellars, etc., though plated "ita" may be assely under extrain special conditions. Zips is expreposibilited, since it forms with wine salte which as ble in the wine, and which not only impise the distribution of the condition of the conditions of the conditions of the conditions of the condition of the conditions of the conditions of the condition of the condi ren in very small quantities

#### محسمامة

The Damperstone of Flowing Lava was measured durlaw the supplies of Etm lass September by Prof. O. Therein, with a Pery radio-pyrameter. Where the lava was still glowing red, temperatures ranging from 705 to still day. Onto, were observed.

the firm Sines for Scientific Beeks.—The council of rankoned Ameeistan of Chomical Scoleties, in Berlin test April, unactimously approved Prof. augmenter in Sever of a uniform size, or series, For cleaning publishesis, and recommended to allithated scoleties adopt the universal format statement, or a format bearing some logical Mats. All publishesions of the Association will approve to the size.

et Bate Mahing.—Prof. Willis L. Moore,
Seather Bureau, has issued a statement in
mass the efforts of a prominent breakfast
ware of Battle Creak to produce rain artihardiy seems necessary for the Westher
at the last day," says Prof. Moore, "to enter
into dablorate arguments in order to convince the public
of the utter futility of this and every other method so far
proposed for artificially producing rain."

Natural and Artificial Asphalt.—In several European sountries, and especially in Austria, artificial asphalt is manufactured and used; but up to the present there has been no direct coinparison of the two from the purely senticed standpoint. Resently, however, Gawalowski has made snahysis of true Barbados asphalt and of the artificial, with the following senulis: Specific gravity, natured, A0145; artificial, 2.30. Hardnessencording to Moha, natural, 1 to 2 deg. B., artificial, 2.30 and 3 deg. M. Hardnessencording to Breithauppt, natural, 1 to 2 deg. B., artificial, 2.30 and particular, artificial, and particular, natural, very easily and moompletely: Soluble in benzin, natural; very easily and completely: artificial, with great difficulty, dowly and incompletely. Soluble in benzol, natural, very easily and completely: artificial, arther easily. Solubility in wax, natural, not known; artificial, in 5 to 7 days, leaving an amber-like remainder. The solution in benzin of the Barbados natural asphalt gives a beautiful brownish variable layer, which dries in about to minutes; thus of the opticial asphalt, however, does not; therefore the first is to be preferred for fine variable.

The Belt and Weight of Our Rainfall.—Mr. George & Lindsay, witting in the Transactions of the Academy of Science of St. Louis, gives some interesting statistics of the rainfall of the United States, not expressed in the conventional inches of depth, but in the aggregate volume and weight of the moisture that falls annually over a given area. To anyone who is familiar only with the outcomary method of stating rainfall, it is somewhat starling to learn, for instance, that 430 outle miles of rain fell in Missouri during the year 1886. This is dededly more impressive that the statement that the rainfall was about 40 inches. In the same year 1,298.4 cubic miles of water is computed to have fallen over the whole area of the United States, and the average annual rainfall is somewhat greater than this; viz., 1,296 cubic miles, weighing 6,000,000,000,000 tons. As an illustration of the fact that most of the water that falls as rain never reaches the sea through the medium of drainage, but is exported from the land, Mr. Lindsay shows that the discharge of the Mississipi River at 8t. Louis is but little greater than the volume of rainfall over the State of Mississipi River at 8t. Louis is but little greater than the volume of rainfall over the State of Mississipi River at 8t. Louis to the first sour since, despite the enormous area drained by the river above that foils.

Street Dust and Street Payments.—In a recent article published in Hygiene Dr. Reaser drawn attention to the considerable danger connected with street dust, the action of which on the human organs of respiration is responsible to a great extent for the origin of subrevulosis and similar diesases of the lings and wind-pipe. But apart from this kind of trouble, dangerous chronic inflammations of the eye should be put down to the action of street dust. In fact, an increase in the frequency of eaterhals he been observed with continued dry weather and a reduction on the ecourrence of the first rain. Under these conditions read engineering, apart from its schnikola tank, has primarily to fulfill a sanitary task. As the production of dust depends on the frings of reads, a pavement complying with all hygienical requirements should be looked for. Asphaled steets would seem to comply with most of these conditions, provided there be an eticasive and thorough removal of waste matter followed by an abundant sprinkling of the road surface. Contobnous pavement, as need with especially satisfactory results in London, would seem to be most desirable. Dr. Reaser does not seem to think very highly of the springing of roads with chamicals, such as sales and tarticle and the street of the street of the surface of the street of the street of the surface of the street of the

#### Electricity

Electrical irrigation.—At Good Ground, L. I., Mr. Emilio Cisson is conducting some experiments with system of irrigation, described some time ago in the layeator's Department of the Scientific America. The porcests cold in Good Ground has been selected for the test. One plot is irrigated with water alone; a companion plot with water destrictly charged, according to the Classon system. The results of the comparative growth will be watched with interests.

As Electrically Fired Ires Farnace.—The electroal production of pig iron has been tried from time to time in Scandinavia, the poor coal supply of the country and the availability of cheap electric power inviting such experients. In a powerful reducing plant ereceded at Troll-hatten, investigations leasing six months have recently been concluded. The energy was supplied at 10,000 volts, three-phase, and transformed to two-phase current with a pressure variable in each phase from 50 to 100 volts, and currents of 5,000 to 18,000 suppores were supplyed in the furnace. The best result attained was 2,341 kilowatt-hours per ton of iron cast, of which 1,500 kilowatt-hours was expended in useful work, showing an efficiency of 71,77 per cent. The furnace is designed to produce 7,500 tons of pig iron during eleven months of

Communication with Railroad Trains by "Railo-phone."—A demonstration of the "Railo-phone," an un-vention for soluting signals and effecting other mechanical operations on moving trains, was recently given on an English railway. Briefly the system comprises an insultand wire laid alongside the track and connecting to superartus at signal eabins and stations, and of a pair of colis wound on frames around the railroad cars, one for enading and the other for receiving. The system operates by induction, and an essential feature is a relay which can only be operated by the promise impulses which convey the signals and is not affected by the non-perioduc vibrations caused by the movement of the trasm. Among other feats accomplished during the tests were the stopping of a train which had been allowed to run past a danger signal and the transmission of a message and its reply between a station and the train.

The Hamburg Electric Ballroad.—The new Hamburg elevated and underground electric road is a romarkable piece of engineering and electrical work and represents the most recent progress on the continent. It is made up of vanduots and bridge structure for about one third the length, and a quarter of the length is underground. The remainder is built of embankments, in part, between amonory walls. Trains are made up entirely of motor cars, each one having two 100 horse-power motors, and the controlling can be done from each of the end cars. The total length of the line is about 16 miles, with standard gage tracks, and the distance between stations is 2,650 feet. The station platforms are 200 feet long. An automatic system of electric lighting is used so that the lights come on only when passing through the underground part. Three-phase current at 6,000 volts is supplied by a special plant at Barmbock, sent to two sub-tations at the principal station of Eppendorf, where it is transformed to 800-volt direct-current. This is employed on the third-rail system, but the contact shoe works upon the under surface of the rail.

A Marvelove Steatical Discover,—In a brief and revolutionary monograph presented to the French Académie des Sciences, Prof. Jean Becquerel, the great physicist, announces a discovery which, when it is confirmed, as it certainly will be, will prove to be outsold importance in the practical workings as well as the study of electricity. It is well known that if a thin strip of metal is fastenced to a giass plate placed between the poles of an electro-magnet in such a way that the plane of the strip is at right angles to the lines of force of the magnetic field, a current passing through the strip from end to end is defected to one add or the other, according to the type of metal of which the strip is composed. Thus the current in a strip of sino, iron, or cobalt is deflected toward the right, but to the left if nicked, gold, or bismuth is used. The effect is especially striking when bismuth is taken to make the strip. From its discovere, Dr. Hall, of Johns Hopkins University, this has been manned the "Hall effect." It has been field as strong evidence that there are such bodies as positive electrons is codefinite for further doubt. M. Becqueral now proves that if the Baltimore is, together with 8 ff. J. J. Thomson and others, convinced that the presumptive evidence in three of the scatismes of positive electrons is to definite for further doubt. M. Becqueral now proves that if the Baltimore is, no, of if the magnetic field is necessarily to the strip of the proper planets. The upsets all known mathematical and physical theories that would make the magnite selections the only carriers of electrons in metals. It again changes our views of the question of what nagative and positive electricity ready is.

#### Aeronautice

A New French Aero Club.—Blériot, who resigned on July 3rd last from the Aero Club of France, has started a new organization, called the Aviators' Friendly Association. Among his adherents are many famous aviators and designers.

France and the Gordon-Bennett Cup.—There has been much activity at Chalons The elimination trials for the Gordon-Bennett oup have shown that Vedrines will, in all likelihood, represent France Recently he covered 200 kilometers (about 120 miles) in one hour and twenty-four minutes.

A Berliner Engine.—Mr. Emil Berliner of Washington, D. C., wall known in connection with his telephone and other important inventions, has patented a rotary grame cagine which has a rotating grame known for the protage with the ports of the epinder of disposed as to be uncovered by the piston as it reaches the end of its stroke following explosion.

A New Aeroplane Construction.—Spencer M. Brown of Portland, Ore, has patented an aeroplane, No. 1,032,-587, which has a pair of upwardly melaned wings which have a pair of upwardly melaned wings which be are united at their lower edges and each of the wings is broken into transversely disposed sections, with each alternating section along the inner edge of nead wing in-clined upwardly to form with the other section a truss-like framework.

A Sixteen-hour Journey in a Dirigible.—The French dirigible "Conto" has made a trip lasting auxteen hours and twenty-four minutes. Under the direction of M. Cohen the craft left from the vicinity of Measur and Fontsinebleau, returned over Paris in the dead of night, then reached Etampes, Arthenay, and Chartes, finally to return to lasy-less-Moulineaux. The maximum altitude attained was over 6,500 lens.

Resistance Tests With Biériet Machines.—The French military authorities have been making some romarkable tests with Biérot momphane. On a special railway train a Biérot momphane was mounted a such a maner that it could assume all possible positions taken in ordinary flight. The train was driven at a speed of 72 miles an hour over a S-klometer stretch

Investigating Accidents.—The Public Safety and Accidents Investigation Commutes of the Rayal Accident Club promises to fulfill a useful purpose in the development of aviation. Judging from the celerity with which it proceeded in investigating the accident that occurred recently at Brooklands, in which an aviator and a passenger lost their lives, we may expect to learn more of those weaknesses in construction accident in the contraction of the con

German Military Aeronautics.—The German Mimster of what has bought for the army the Siemens-Schuckert dirighle airship. In trials conducted last February the vessel attained a speed of 43 miles an hour. The dirighle "2-2" attained at Cologne, a Faravul airship, and fifteen or twenty aeroplanes will take part in the fortheoming maneuvers. The dirigiles "2-3," which was badly damaged at Friedrichshafen, is now completely reneared.

The Birrio Berline. The aeral taxicab or berline, built for Doutsche de la Mourthe by Biërot, has been making some remarkable flights The 100 horse-power motor has been removed, and in its place a 140 horse-power engine has been matalled. Loaded with about 650 pounds of ballast, it carries a cargo equivalent in weight to that of four passengers bendes the pilot, As yet, no four passengers have ventured to take their seats in the taxicab body

The Pirst Aerial Derby.—The English Aerial Derby showed that flying can be made a real sport. More enthusiasm was invoked over a contest for a 100 guines trophy and cash prizes of 2450 than was aroused only the \$50,000 prizes of the Darly Mari in the wast. It is safe to say that millions saw the race. I though Aerid home, we are sawired by our contemporary Flight, at least 45,000 paid for admission to the incourse, while on the adjacent slopes several thousands more were massed. The same state of affairs applied at every point around the outere of \$1 miles. Hamel, one of the dontestants, stated that Esher Common was absolutely black with people.

Gaiding Torpedoes from Aircraft.—In patent No 1,032,394 Bradley A. Fiske, U. S. navy, presents a method and appearate for delivering submarine torpedoes from aircraft in which the torpedo is first transported through the air to a point of desertel proximity to a target by means of an aircraft and then the torpedo is a target by means of an aircraft and then the torpedo is trained in the desired direction, after without the torpedo mechanism of the late of the torpedo is trained in the district direction of the torpedo in the same of the sam



On striking the timber the motor-cycle acquires a mounting position.

#### Testing a Motorcycle

A MANUFACTURER of motorcycles in the Middle Mwest experienced considerable difficulty in his ently days with spring forks. He was using a very high grade of steel, but nevertheless the forks world sometimes break in the hands of bicycle users. They sometimes break in the bands of bicycle users. They employed consulting engineers to find out what was the matter. The verillet was that the apring forks were the best that could possibly be made. One engineer, however, had made a change—not a change in design, but a change in material—substituting a steel some-what more brittle. That seemed very foolish. In order to prove to the manufacturer that he was right, he offered in design and the processing in the manuser shows the offered to test-the motorcycle in the manner shown by the accompanying illustrations. He rode around a test track, banked at the turns, at a speed of five to sixty miles an hour, striking an obstruction (a four by four timber). Every time the motorcycle encountered the obstruction it leaped into the air approximately two feet and alighted ten feet farther on T being performed by several testers daily

#### Transatlantic Wireless Telegraphy Without Antennæ

H UGE towers for carrying up the antenna system
to sufficient height above ground have been built
at several places, e.g., Poldiu, Chifden, Giace Bay,
to make transatiantic radio-telegraphy possible. The
highest building in the world, the Effel Tower (about 1,000 feet in height), has in its turn been utilized for the purposes of wireless telegraphy, while the sending tower of the Nauen radio-telegraphic station was recently raised from 330 feet to 660 feet in height, thus allowing the African colonies to be reached from Berlin by wireless telegraphy.

It will therefore be readily understood that experi-ments recently made in Berlin with a new arrange ment due to Prof Zehnder should arouse more than usual attention. The new scheme, in fact, does away with any antenna An ordinary insulated conductor wire carried on telegraph poles is connected at both ends to the ground, with or without the intermediary of Leyden jurs. The total length of wire between the two ground connections should at most equal one half wave length of the alternate current employed. If, for instance, the wave length in air be 4,500 meters (28 miles), which is about sufficient for transatlantic operation, the ground connections would have to be located at 900 meters (2,952 feet) apart in the ground and only 250 meters (820 feet) in water. This conductor is excited as usual in its central part by conductor is excited as usual in as central part of a Bream vibratory circuit, the length of which is turn to the frequency of the whratory circuit. The new scheme at the same time conditutes a system of directed wireless telegraphy, the direction of

the wire itself being the most favorable for sending. In a like manner, if a receiver be substituted for the exciter, the preferential receiving direction will given by the wire

This scheme, in spite of the provisional character of the arrangement, allowed telegrams to be sent with small-size sending apparatus and without antenna, to many hundreds of niles. Herr Kiebitz, of the German Telegraph Department, in his experiments on behalf of the department transmitted radiograms from Berlin to Norddeich and with the ordinary type of receiver, received in Berlin messages that came across the Atlan tic Ocean from Glace Bay, Nova Scotia

One advantage of the scheme suggested by Zehnder is the possibility of installing the whole of the apparatus in the interior of a building fortress, man-of-war. etc., thus protecting it against destruction by storms, galos or the enemy's guns, which will be found of inappreciable value in warfare. Incidentally these experiments appear to show that the transmission of



Position of the machine two feet above the testing track on a ten foot leap.

electric waves in great part occurs through the earth

### The Curtiss "Flying Boat"

New Type of Hydro-acropiane
SiNCE he closed his camp and aviation school at
San Diego last spring, Glenn Curtiss has been steadily at work at his home in Hammondeport, N. Y., making further improvements upon his hydro-aeroplane. photographs reproduced on this page, which give a good idea of his latest combined boat and biplane, known as the Curtiss "Flying Boat."

This boat is a single step hydroplane, 26 feet long, 3 feet wide, and having sides 3 feet high. It is surmounted by a regular Curtiss biplane, having planes of 30-foot spread by 5½-foot depth between the planes. The planes contain a total supporting surface of about 320 square feet, and supporting surface or about 320 square feet, and support, when in flight, a total weight of about 1,000 pounds. As many as four people can be carried comfortably. One of our Illustrations shows a man in a battling suit lying on the deck of the boat behind the planes in addition to

the pilot and passenger in front The power plant consists of an 80 horse-power Curtiss 8-cylinder, V-type engine and single propeller mounted high up between the main planes at the center. The motor is mounted sufficiently high to provide liberal clearance between the end of the p blades and the boat, the propeller being just back of the main planes, as usual,

Above the tapered hull of the boat, at the rear, is a



senger lies well to the rear.



The new Curtim hydro



vertical fin terminating in a large vertical rudder.

The tail is placed about half way between the boat, and the top of this fin, and extends out on each side; and the top of them his, and excesses out on soon assets, of it. The horizontal redder consists of two hisper fique at the rear of the two haives of the tall. Near front clevator is provided, so that the glitch has a clear view in front over the spray hood that is fitted, The balancing planes are at the rear, half way be. The enimping planes are at the rear, half way be-tween the main planes. Inclined cylindrical fleats are fitted below the ends of the lower plane ig case, the machine tips in making a quick turn on the water. This new flying boat of Curtiss's makes aviation

erfectly safe, as one can travel 50 miles an hour on se surface of the water, or 60 or more miles an hour as few feet above the surface. It will open up to the motor beat enthusiast heretofore unnavigable streams. In fact all the unusued canals and shallow rivers of the country can be skimmed over always with complete safety by the yachtsman-aviator.

#### The Current Supplement

IN the current issue, No. 1909, of the Surrent Dr. Gradenwitz gives an illustrated account A Dr. Gradenwitz gives an illustrated account annuatracture and testing at high tension of porceion electric insulators.—W. B. Ingalis, the well-knows metallurgist, writes on the electric saselling of since-incomposition of the more railways station in course of construction at fails, sig. which, when completed, will be the largest is giz, which, when completed, will be the largest is giz, which, when completed his excellent article on accomechanics.—An instrument by means of which the billing are enabled to preceive light through their sense of hearing was recently exhibited by M. Fournier d'Albs, of Birmingham, England, at the Optical Convention. An account of this is given in the curried issues.—Some very excellent points are made with reissue.—Some very excellent points are made with regard to the Oldfield bill in comment reproduced from Metallurgical and Chemical Engineering for July.—A new method of preserving eggs, which is said to possess altogether superior merits, is described by our Paris correspondent.—The closing article deals with experiments on the durability of tool steel.

#### A New Andean Railway

THE American minister at La Paz, Bolivia, reports that on May 15th the rallway recently built from A that on May 15th the railway recently built from Potost to Rio Muisto, a station between Oruse and Uyuni on the main line, between La Par and Antofagsata, was officially opened at Potosi by the president of the republic and his cabinet. This railway, susveyed, planned and built by American engineers and contractors, is regarded; as a marvelous place of construction. At one point the alithade is about 16,000 feet, making fit, the minister states, the highest railway in the world. Not only was the road very contip to build, but it, still be cought to medically account. to omin, but it will be costly to maintain, apparently out of all proportion to the prospective business. There, is not a village or hamlet between the terminal points; m and Potosi, which had once a population of 200,000, has, now fallen to 25,000. to build, but it will be costly to maintain, appe

#### Rebuilding Messina

AFTER the great earthquake of December 28th, 1808, which completely destroyed the city of Messins, the few survivors, aided by international philanthropy, erected temporary wooden buildings south of the old city, and here commercial and official busior the old city, non nere commercial and omicial bus ness has since been carried on. On the original si of Messina not a single building had been exceted it even began up to the end of last year. Now, however preparations for rebuilding the city are well units way. Bilno. Zinji, 1911, the systematic resumed of & débris from the streets has been in programs. The stion includes a raise in the level a don of the harbor front.

SOLA - APPLICATION

### From Clay to Bronze

#### The Craftsman's Part in the Art of Sculpture

.By C. H. Claudy

ME ciny is the life, the plaster death, and marble the resurrection." A famous artist's words, thre of the forms through which a statue must regular it and in the white marble which is so referred to above, or in the sterner and ring bronze of the hereic size statues, too

The state of the s

da and the lifethe subject. en, in some way, mally passed over the expression the expression termediate atena the general public knows little, yet those intermediate steps are of the utmost importance and of great interest. It is in them. as well as in the casting of the molcraftsman steps in and replaces the and replaces the artist—the place where the most highly skilled labor is necessary, and where the greatest artistic skill in no value.

When the wet clay, preserved from day to day by being constantly shrouded in wet cloth, is finish and has the lifelike form of the subject to the utmost of the artist's expertness, the craftaman prepare to make a moid from the clay. This mold is not used to make the bronse tended to be em-ployed for making a plaster cast of clay. From this plaster cast, the final mold is made in which the bronse, streaming and hot, is poured. The great interest in this operation of making the placer mold and plaster cast comes from

the fact that the the fact that there is no retracing the steps once made—no second chance if the first one falls. To make the mold, the clay is if the first one falls. To make the mold, the clay is three since, that let this pleese of tim! This apparently disastepons proceeding is necessary, for the mold, when middle, mayst be in two or more places and some division between the two is persently. So many this pleese of this are used, and are ruthlessly stack into the clay, requiring reinder pertitions along what are to be the divided lines of the mold. The strips overlap and applies this these from the clay. The clay is then wet down and then covered with a thin, cream-like placers of less than the covered with a thin, cream-like placers. The state of the covered with a this, cream-like plaster forms statement; it makes little difference what color it fair, it makes little difference what color it fair, it may easily distinguished from white. The off of the first colored layer is seen later on. The plast is a granulated and thrown on the clay the first colored layer is seen later on. The plaster is a granulated and thrown on the clay the first colored layer is seen later on. The clay the colored layer is seen at the colored layer in the clay that the colored layer is seen to be a seen to consider the clay that the colored layer is the colored layer in the clay that the colored layer is the colored layer in the clay that the colored layer is the clayer in the clayer in the clayer in the clayer in the clayer is the clayer in the clayer in

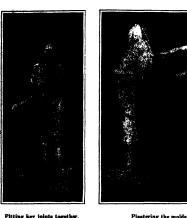
part of it completely, and to have the liquid penetrate into all the folds, crevices and indentations of the clay. On the skill and care with which this is done depends the success of the mold.

soon as this first colored layer has been finished. and set, it is built up to a thickness of perhaps an inch with thicker plaster of Paris, uncolored this time. Next, a framework of pipes, wood, wire and rods is

four hours, and frequently longer. Next is the important and delicate operation of removing the moids from the cia; The delicacy of the process comes in because the molds do not always "pull," that is, to get the molds off, it is necessary to break the clay and to destroy it; in one of the pictures the caster (who, in this case, is also the sculptor) is removing the back pieces of the lower mold of the heroic size statue. The

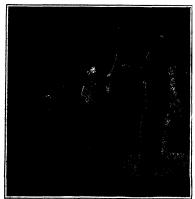
cont tolls have been mold, and the clay composing then must be dug out by hand, and with streams of water. The picture also shows the destruc tion wrought in the arms of the statue. the molds of which ruined the clay is being taken off

When the vari-ous pieces of the plaster mold are all removed, they are cleaned thor oughly of all clay.
washed out and
finally anothted with a specially prepared grease which will prevent the plaster which forms the cast to be made, from sticking. They are then assembled in place, read; for casting. In so large a statue as forms photographs, no at-tempt is made to cast the whole in and half the trunk form one piece, the head and chest another, the two arms are cast separately and so on. In order that the several turts should fit our another accurately. the molds are fitted together as the casts are made, and "key joints" are constructed, the raised or "dowel" part of the key being formed on the first cast made while it is still in the mold (and is grease) so that the second cast when made shall form its recess or female part of the joint. thus insuring an accurate fit



The Suished plaster cost.

Fitting key joints together.



The operation of taking off the moids

erected about the statue in such a way that each part of the meld, as indicated by the division lines of projecting tin, has its own set of braces. Once these are in place, the making of the mold proceeds rapidly, with an assistant mixing plaster of Paris in a bowl, and the craftsman-caster throwing and kneading the wet masses onto the plasser covering the way, where the most strains will come, where it may be five inches or more taked, and permitting those portions where little strain may come to began not more than an inch or two taked. They may be supported by the property of the strain way come to be spain not more than an inch or two taked. This time role and pipe frameworks are well exhedited in the plaster so that they, themselves, will take medic of the serials when it becomes time to lift or more parts wit the mold.

Then the caster is through this part of the work, who whole is allowed to dry or set for at least twentyonto the plaster covering the clay, being particular

ouring of the plaster for the final cast is also a delicate operation. The plaster must not be too thin, or it will run away from some parts of the mold and settle in other portions; it must not be too thick, or it sectic in ounce portions; it must not use too inck, or it will not run into all parts of the mold. The casting must proceed uninterruptedly for each set of molds, or it may not come out a homogeneous mass. Generally, the molds, bound together with rope and wire, are turned about as the plaster is run in, to be sure of getting an even and complete casting. The molds are not filled with plaster, as that would not only make the cast very heavy, but give it an excellent chance to split from strains incident to hardening. The walls of the plaster cast, like those of the mold, are from four to six inches or more thick, but a hollow space is always left in the trunk and less and arms of such a statue so that in drying there is plenty of room left for air to penetrate and get to both sides of the cest. When he molds are all cest, and the whole has dried a sufficient time, comes the most delicate part of all getting the molds off the cast. For these will not pull from the plaster cost any more than they did from the clay. In this case, however, it is not the cast but the molds which are broken in removing them, and now the significance of the colored layer in the mold becomes anywhent. The caster, working away at his molds with mallet and chiese, its safe so long as only white chips fly, as soon as he gets to the colored layer, the pose more currently, knowing that immediately bethe goes more currently, knowing that immediately beneath it lies the cast. The molds are taken off in many places and thrown away; their function finished, what remains is a plaster cast, exactly like the original clay, which may be shipped away to the bronze factory (as the clay could not be shipped) there to have molds made in many places into which the bronze is

Large statues like the one illustrated take several duys to cast both mold and plaster cast, and at almost any time, the labor of months of sculpturing may be ruined by careless work. Of course, molds are broken in making and statues in plaster are chipped. These accidents are not necessarily reminers, as begins in either mold or finished coat can be supprised. But the destruction of the clay that the finisher mold, only we made, the destruction of the solid that the jumps made, the destruction of the solid that the jumps can make the common of the solid that the jumps can make the common of the can of the claim of the can of the supprised and the solid that the canternament of the supprised that the canternament of the canter takes of the can of the canter takes the can of the can of the canter takes the can of the can of the canter takes the can of the can of

### A New Form of Underwater Attack

#### A Torpedo that Carries a Gun

By Robert G. Skerrett

W 1TH the exception of some ships now building or planned, the thousands of tons of armor plate carried upon modern fighting craft are designed exclusively to combat passively the attack of various types of gun-fired projectiles. Relow the load-line, these vossels depend for security upon the surrounding water, so far as the attack of artility is concerned. The top-load has commonly in the past been considered as initiated in its range and so uncertain in its performance that but little weight has been attached to it by the partisons of the gun Battle ranges seemed logically to keep the torpido in the background, except at night, when the speed; top-deco-boat counted upon getting near enough to launch its weapons with a more reasonable promise of getting home a hit. The naval constructor, accepting the torpedo at its potential value as seen by the majority of the fighting direct, simply limited his efforts to frabricating the under-body of his flighting craft as to that the damaging effects of a chance blow from a torpedo should be confined to a restricted area. Hence the inner and the outer hottoms, and the water-tight, cellular dividoning of the intervening space. As a matter of fact, the naval constructor's work stood up under torpedo attack and performed its function remarkshib well. It is a matter of record, that the general run of torpedoes fired during the function remarkshib well. It is a matter of record, that the general run of torpedoes fired during the struck were not sunk as was counted upon, but were able to get Into port and be required.

There were ships lost to both beligerents by subaqueous attack, but the most conspicuous of these disacters were due to the violent blows of pastive mines. Where the active torpedo had failed in its mission the anchored, fouting mine filled the offensive gap. These mines carried larger explosive charges than the torpedoes then in service, and proved two things: First, that the naval constructor had planned well, and, second, that the automobile torpedo must needs be made a more powerful weapon if it were to fill the office intended for it.

In the Russian fleet at Port Arthur were several vessels that had been built by the French for the Russian Government. In addition to the usual comparimenting of the inter-bottom space, the Freich designers had reinforced the region most likely to be attacked by torpedoes by means of a caison built of plating nearly two inclose thick. The object of this catsson—assuming that the explosion of the torpedo should be sufficient to read or rapture the plating of the liner and outer bottoms—was to provide more space in which the guncotton gases could expand and dissipate the most dangerous percentage of their remaining force. The ingenious theory of this style of construction was proved to be all that its originators ciantend for it. The Russian ships so built were several times hit by Japanese mines, and, while greviously wounded over wide areas of their under-hodies, yet the caisons remained substantially intact, and the vessels were able to return to herbor. The Russian and the Japanese threships that were such by means of mines went to the bottom suddenty, because the force of the lursting mines was sufficient to defounte the neighboring magazines; but it is not believed that the vessels loot in this way had the protection of calssons immediately next to the double-bottom space.

The immediate result of the lessons taught by the Russo-Lapunee wart—so far as they concerned underwater attack—was a widespread realization that the automobile torpedo would need some radical modifications if it were to make good in the future. Apart from the destrability of greater speed and greater range, the most conspicuous need was the power of delivering a more damaging blow when once in contact with its target. To that end, the size of the weapon was progreately increased in order that it might carry a bigger bursting charge of guarantee; but the bursting Pills desdigeratink has been railined; but the bursting

charge of the biggest of the present day automobile torpedoes is not as large as that of the mines which damaged the ships of both belligerents during that

As a matter of fact, the more recent dreadhoughts have the under-water protection of the ecisesson or its equivalent, and one can't help but ask. "How does the increased charge of the warhead meet the requirements of to-day?" In addition to this, armor is being added to the defense against torpelo attack, and the splacing the underwater weapon at a still further disadvantage. Its chances of spreading have deep enough to affect a shift's vitals are more remote relatively to-day than they were during the struggle between the Russians and the Japanese. It is manifered that there is a big gay in this line of attack which the Whitehead and its various kindred rivate cannot fill, and here it is that the genius of an American, Commander Cleland Davis, of the United States Navy, provides us with an answer and pinces the torpedo upon a new and a more formulable footing.

ommander Davis has bluzed a new path in the art. He has abandoned the guncotton warhead, which has been the accepted instrument of destruction since the ption of the Whitehead, and has substituted a gun in its stead. If one will study carefully the photo graphs of either bursting submerged mines or explod-ing automobile torpedoes, the most impressive visual sign of the violence exerted will be found in the great volumes of water blown heavenward. The water vielded more than the steel structure attacked, and spent the major part of the energy designed to wreck has spent itself uselessly in blowing hundreds of tons of water into the air. Commander Davis has sought to so concentrate the powers of assault in his torpedo that but little of its force should be dissipated in disturb the surrounding water while the bulk of the energy of his wespon should remain unimpaired and centered in piercing the enemy's defenses and penetrating to the very vitals of the object of attack. Commander Davis does not discount in the slightest the trnly re markable developments which have taken place in the other departments of the automobile tornedo. Increased range, higher speed, and more precise functioning all help him toward his objective; but it is his invention which makes this underwater projectile a graver menace to the biggest and the best of fighting

The Juvis torpedo, recently tested in the waters of the Lower Chespieske, carried an S-inch jum capable of expelling an 8-inch projectile with a muzzle velocity of something like a thousand feet per second. Ordinarily, an 8-inch gun strong enough to fare a shell with this velocity would be far too big and too heavy to be placed within the permissible limits of a torpedo. We are speaking of a piece of ordinance to be fired in the open air. Now, the Davis gun, when fired, is any rounded by the sea, which, so to speak, relationes the walls of the gun, but this is not ail. The weapon is made of vanadium steed, which has a very high elastic limit, and this great strength on the part of the metal makes it possible to construct a gun of seemingly ridiculous lightness. This fact has made the new torpedo practicable.

The mustic velocity of a thousand feet a second is quite enough to carry the projectile through a single plate of Krupp armor, something like four or five inches thick when virtually in contact with the musule of the gun—as would be the case with this torpedo. Now, ships are not protected under water with plaining of these dimensions, and it would be a much easier task for the projectile to pass successively through a number of thinner plates even if their combined thiesness were more than the limit set. The projectile fixed from this new torpedo carries a bersting charge of high exploitre of between 35 and 40 pounds. This charge is detonated by a delayed-action fass, which is designed to meet the parkinvan requirements imposed designed to meet the parkinvan requirements imposed by the best protected dreadmoughts built, building, or projected. Our illustration represents the Davis torpede attacking aship of the Danton type of the French navy; resuels that typity recent practice, and which have the protecting caiseon that saved some of the ships of the Port Arthur fleet from sinking when they lit the Japanese mines planted outside of that port. In our picture we see the shell picturing the five opposing builtheads of steel, passing through one of the coal bunkers, and bursting in a boiler room. We must leave to the imagination the dreadful aftermath of this attack and the destruction of a boiler charged with high-pressure steam. The same shell might have hit either farther aft or farther forward and bored its way right into a magazine or a shell room, the consequences of which would be even more appailing. The disturbed water has been occasioned by the escaping propulsive gases from the gun, which have served to tear a big rent in the outer plating of the bottom of the ship, and the liberated air from the torpedo's air faak. The surface disturbence is very modest compared with that which either a submarine mine or an automostite torpedo of the usual types would produce.

The diagram under the picture represents the Davis corpido, and show a longitudinal section through only that part where the run is installed. When the weapon has been launched upon its sinister errand the little propeller at the upper side of the torpedo's nose revolves and releases the tripping red, so that the torpedo can be discharged upon contact with list target. When the roll hist the obstruction it is driven beckward and engages the trigger which first compresses a spring attached to the firing pin and then releases it so that the pin can strike for gun primer, thus setting off the propelling charge of powder which drives the shell out of the gun. As soon as the projectile hits the outside plating of a shifty shotton the fuse in the base of the shell begins to function, being set to explode the charge in the shell so many hundredths of second after impact. During the recent tests in the Chesarge in the shell so many hundredths of the shell conside, passing through a couple of armored bulkheade to side, passing through a couple of armored bulkheade in route, and then exploded in the water boyond. The second attack was against that side of the target which has further protected by a plate of three-luch steel. The shell exploded at the instant of impact, and did not pass into the target, but the structure was so damaged that it sunk shortly afterwards. The lesson of the second attack had stress only upon the fact that the fase, was not properly timed, otherwise the shell would have entered the calsson and exploded in-side, doing still more damage. This is merely a matter of refinement, and does not qualify the starting possibilities which the Davis gua-torpedo suggests. In the placed upon every fighting carft, and this must add greatly to their displacement and their cost, or beprovided at a sherringe of other vital features.

#### The Fire Sprinkler—Plain Business Proposition

PIRE COMMISSIONER JOHNSON, of New York, Pays: "As a business proposition the most effective five prevention appliances which the Fire Department can order installed mean dollars saved to the owner of the large factory or other place of business. I refer to automatic sprinklers. Fire prevention experts agree that automatic sprinklers, coupled with a device for sounding an alarm direct to fire headquarters, form sounding an alarm direct to fire headquarters, form the best known method for preventing destructive size. Experience of many years shows that automatic sprinkers, either the chest mutil the deginerment apparatus arrives to put on the finishing touchies" In two thirds of these cases the fire is completely and out by the time the department apparatus.

chemical to complete the fields

### Correspondence

offices are not responsible for statem the perceptondance column, Anonymous he consist be considered, but the name tents told be intibheld when so desired.] MONE COM-

#### A Typowriter Ribb

We the fiditor of the Schemertz-American:
Hence allow the Schemertz-American:
Hence allow the to suggest the following method of
midding typewriter ithium.
While hence of the ethium is the so-called "seam binding,"
origin hear he obtained at any dry goods store. It is
alogue one half inch in width, thin, and of fine octure.
The while theseld be purchased.
Limps-liked is thoroughly incorporated with castor oil
by grinding in a mortar. This is brought to the consistment of the parint with alcohol. The ink is applied with
a sighth or brush. Oil-soluble colors may be used instead
if hem shield.

C. C. KIPLINGER.

#### Gyrescopic Action in Aeroph

To the Editor of the SCHEWISEIC AMERICAN:

With all due deference to Mr. Jetwan's experience (as related in Correspondence, April 20th) it seem rather psculiar that simply because a gyroscope is in a settypiane it should dely the laws of nature.

The Bieriot machine of which he speaks ally circle in whichever direction it is started, because the center of gravity is behind the wheels, so that the centrifugal force throws the tail out. It might be started contribugal force throws the tail out. It might be started in dither divoction in many ways, such as a side gust, untrue wheels, or a slight turn of the rudder. It might be tracted to the left (with right-hand propelly) by the drag of the torque loaded wheel or gyroscopic section white the tail use riving. The latter would be momentary, and after the tail had feel in two old tend to make the machine travel straight rather than circle.

"Toronto To. Charten & Strangerman."

Toronto, Can.

CANADIAN SUBSCRIBES

#### Politics and Good Roads

To the Editor of the SCIENTIFIC AMERICAN

There read with interest your article in the Squanting
American of May 11th, 1912, on road conservation.

During the last sky years I have traveled over many miles
of reads in nearly all the Eastern States, and have
watched with a great deal of interest the great increase

in road building.
It is a delight to travel over a new State road during the first year of its life. The second year the delight is considerably less. The third year you are tempted to take to the open fields, so terrible is the going.

this time the road needs rebuilding in most case

and this means a fat contract. To me this has always been the explanation of why no

attempt is ever made to preserve the roads.

attempt is ever made to preserve the roads.

The original contract usually goes to some favored politician. The sole scheme being to get all the profit or graft possible, the construction suffers. I know personally of one instance where an engineer insisted that a sousset, or one instance where an engineer inflated that a politician-contractor comply with the conditions of his contract, and was immediately transferred to another part of the State by a complacent State Department.

part of the State by a complacent State Department. The quicker this road wears out, the quicker the politician gets another fat job, consequently no repairs are made. Road conservation is therefore a jobe. A large part of the taxpayers '\$30,000,000' gross to build up local political fenoes, and faulty roads which two or three years later require at least another \$25,000,000 for rebuilding.

It all means prosperity to the politician-contractor.

(There can be no doubt that our correspondent's con-tention is correct. Not until read building and read maintenance are placed upon the same sound business basis that underlies every well-conducted industrial en-terprise, is it likely that we shall have roads that are good, not simply for this year and perhaps next, but roads that will be good generations hence.—EDITOR.

#### "The Digestion of a New-born Infant"

To the Editor of the SCIENTIFIC AMERICAN

In your issue of June 1st, on page 494, you have a short article under the above heading. It is no recent discovery that new-born infants are capable of discoving food or that they possess discoving formants. You mention of Dr. Alfred F. Hess that: "In capatic or digesting trees of the description of Dr. Alfred F. Hess that: "In the storacehe he found not only hydrochloric acid, as in a saids, but the two femonts peptia and rennet." While is is seue that milk requires almost no effort on the part of the digestive system, what little hit it does require is absultably essential to the process. For instance, in all higher annuals the first steps in proteid digestion is accomplished by peptia, a ferment which cannot not except it an acid medium. Hydrochloric being the kind of said found in the stomache of eachivors and omnivors. Elle mentals alcompanied by small quantities of lactic saids." Summer also is found of great importance in the

Market Co. Site

n of milk. It is hardly correct to call it rennet, as digestion or mills. It is narray correct to come to return, remark is a commercial preparation used in the manufacture of cheese, and is obtained from the stomachs of suckling celves and pigs usually.

The other ferments which you mention, namely, pro-

case and lipase, are also necessary. The way in which plishes the digestion of the butter in the second prime and the second of the se from the inner surface of the mucous membrane of the s, shaped like minute fingers, they are highly differentiated strustures whose chief office is to absorb these digested glycerides.) Once within the vill, the synthesis of fatty sold and glycerin into fat becomes posrible. Lipase is greatly aided by the bile in its work of sting fat.

The hydrochloric acid in the stomach does not have The gydronizers and in the stomach does not have any great effect on bacteria. In fact, none of the diges ive juices possess bactericidal properties. Fortunate so, as so very rarely are bacteria harmful; the pathogen Fortunately kinds form such a small proportion of the whole.

It might not be out of the way to state that indigestion rarely cours as a result of an insufficiency of digestive jules, but as a result of too concentrated foods; thus failing to distend the intestines, and so encourage peristals.

Appropos of this, Dr. Charles E. Buck of Boxton says. "This condition never arises." "This condition never exists in the lower animals, who seldom suffer from intestinal troubles, because the food that they eat contains coarse particles of indigestible sidue, that pass along the entire intestinal tract. Oak Ridge, Va.

#### A Notable Lightning Stroke

To the Editor of the SCIENTURG AMERICAN:

On the afternoon of July 18th, a discharge of atmospheric electricity occurred in the village of Rockport, Ontario, which presented some features of unusual interest. About 6 P. M. a short and light thunder shower passed over the locality The lightning seemed to be distant and the thunder was not loud. A single flash, however, struck a large white pine tree some seventy-five fest high, and tore the upper half into ces, breaking off the branches, stripping the bark and throwing one large fragment several hundred feet away into the St. Lawrence River.

From the tree the discharge apparently followed the telephone wire into a near-by house, smashing the win-dows, splintering the woodwork, breaking a 2-inch hole dows, spinistering the woodwork, breaking a 3-inch hole through a wire sereen door (the broken wires showing traces of fusion) and curiously enough, tearing off the metallic casters from a table. The telephone was con-nected with a ground wire which was attached to a window casing. This wire entirely disappeared, and

meted with a grounwindow osaing. This wire entirety unonly a groove in the wood was left.

Two ladies were standing near the telephone, one
in the act of using it. Both received a severe shock
and were temporarily stunned and benumbed, but

a few hours without apparent injury.

and the long-continued drought, the ground connection was doubtless imper-fect, which led to the damage to the house. Probably,

test, what set we not cannage to the house. Trousdry, however, it was the imperfect connection which saved the building from more serious injury.

In a building a few rods away a young man was holding a telephone receiver to his ear when the discharge occurred. He was thrown to the ground and charge occurred. He was thrown to the ground and received a severe nervous shock from which he did not recover for several days. This building was entirely uninjured, the telephone showed no marks of fire or any other injury, and none of the bystanders felt any

The interesting points about this discharge were the sudden development of a large amount of electrical energy in a very light storm, and the almost total absence of marks of fire on any of the objects or perassence of marks of are on any or the objects or per-sons struck. The splintering of the enormous pme tree could well be accounted for by the instantaneous development of steam from the sap in the wood, in connection with the expansion of the air in the tissues caused by the sudden heating by the current. The broken glass was thrown outward, indicating an expan-

broken glass was thrown outward, indicating an expansion of the air in the rooms of the house.

One of the ladies struck said she felt no pain or shock, and remembered nothing except finding herself on the and remembered nothing except until mercels of the foor. The young man, however, felt a severe shock at the time, and the current probably passed from the receiver at his ear down the left side of his body, as that side and arm were benumbed for several hours. It was probable that this was an induced current in the telephone wire and not the direct discharge, as this telephone was connected with an entirely different

reuit from the one first mentioned Reckport, Ontario. Austr AUSTIN P. NICHOLS.

#### Magnetic and Electrostatic Attraction and Repulsion

To the Editor of the Scinymer American: was interested to read in your columns a short letter with reference to the force action between charges, and that between magnet poles, but do not exactly agree with the conclusions drawn by the writer, who apparently fails to take into consideration certain henomena of induced electrification. In a certain case it is true that under some conditions the question pulsion or attraction of charged bodies upon the magnitudes of their charges, but only in an indirect manner, and the general law of the force action between charges still governs, even in the apparent ex-

ception noted. To make the ake the matter clear we might summ law of force action referred to. Briefly it is this Like charges repel one another and unlike charges attract one another with a force which is directly proportional one another with a force wine is circuit projections in the product of the charges and inversely proportional to the square of the digitance between them. This fact, together with the principles of induced electrification, explains the phenomenon noted by your contribution, namely, that if a body having a sufficiently great charge is brought near enough to another body having a charge of the same sign, attraction will result instead of repul-

sion, as we should expect.

When a charged body is placed in the neighborhood of another body (whether the latter be charged or of another body (whether the latter be charged or uncharged) two mdused charges of equal magnitude and of opposite sign are produced upon the latter, the one of like sgn being the farther from the inducing charge. Since both charges are of the same magnitude, and the one of unlike sign the nearw, it follows from the law as to distances that the attraction between it and the inducing charge is always necessarily greater than the repulsion between the other charge and the inducing charge. Therefore a body originally uncharged is always attracted. If the body had originally a small is always attracted. If the foody had originatly a small charge of the same sign as the inducing charge, the body will be repelled if the distance between it and the in-duced charge is such that the difference in the distances of the two induced charges is small snough to make the difference between the forces on them less than the rapulsion between the inducing charge and the charge originally on the body.

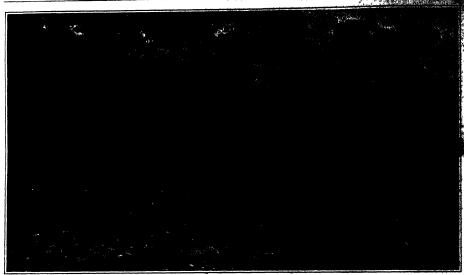
To make the matter concrete, suppose a body with a positive charge of q units placed at a distance of 100 centimeters from a sphere of 5 centimeters diameter, and having a positive charge of 1 unit localized at the end of the diameter nearest the first mentioned body. Suppose, further, that the induced charges are each Suppose, turtner, that the induced charges are essen 5 units similarly localized, one at each end of this diameter, as shown in diagram. Such a distribution is, of course, impossible, but the reasoning will apply equally well to the actual distribution.

We then have force action due to free charge of 1 unit =  $1 \times q/10,000$ . That is repulsion = q/10,000 dynes. Similarly, the resultant force action (attraction) due to the induced charges is 5q/10,000 - 5q/11. 025 or about 5q/110,000, approximately one half the repulsion. Therefore, the resultant is a repulsion. If repulsion. Increase, the resultant is a repulsion. It the induced charges were to remain constant (they actually increase) as the charge q is brought up to the neighborhood of the sphere, say 5 centimeters from it, we should have Repulsion  $-1 \times q/25$  attraction  $-1 \times q/25$  attraction  $-1 \times q/25$ . 5q/25 - 5q100 Resultant = 11q/100 (attraction). This 59/25—59/100 resultant = 119/100 (attraction). This makes it evident that whether a physical object is attracted or repelled by a charged body is a matter of the relative distances of its charges from that body, the law as to the charges themselves still holding.

The conditions are very similar in the case of mag-ets. When a piece of magnetic material not manifesting poles is brought into the field of a strong magnet it develops poles, that of unlike sign being nearer the magnet pole which induced it The laws of magnetic magnet pole which induced it. The laws of magnetic force action being precisely similar to those for electrostatic action, the same result follows as to attraction namely, any unmagnetized bar of magnetic material is attracted. It may be laid down as a pretty safe rule, however, that like magnetic poles never attract The polarity of a weak magnet may, however, often be reversed by bringing it into a strong field so quickly or in such a manner as to prevent its taking the position which the field of the stronger magtaking the position which the held of the stronger mag-net demands. This has been a source of some annoy-ance in the case of compasses used in the laboratory by students who were careless in this respect. To sum up definitely, it may be stated that the laws of force action always hold as between charges,

or as between magnet poles. Apparent exceptions in the case of charged material bodies are due either to oteristics of the bodies themselves or to the particular sets of magnetic or electrical constants ined. If not prevented by inertia, friction, or other as from doing so, these bodies behave in accordance M. F. THURSTON. with the laws as stated

Syracuse, N. Y.



SCIENTIFIC AMERICAN

Fig 1 -- Northeastern corner of Structure 1, showing the hieroglyphic cornice restored to its original position.

# Quirigua-An American Town 1,400 Years Old

Glimpses of an Extinct American Civilization

By Sylvanus Griswold Morley, Acting Director Quirigua Expedition, School of American Archeology

Darli the Months of February Murch and Luifed Fruit Company maintained in the field at Quirigua Guatemaia an archaeological expedition the work bring under the direction of the School of American Archaeology

can remanding. Quiriqui was one of the older centers of the great Masu civilization which fourished in southern Macu civilization which fourished in southern Macu Cantennia and northern Honduras during the first fifteen cuturies of the Christian era. The writer between the occupation of this site instead approximately from 450 to 550  $\Lambda$ . D. though Maya students differ considerably on this point  $^4$ 

The work of the two previous seasons of the school and training 100 and 1011 was largely of a prepara tory nature. In 1010 the ratins were surveyed and a reservation of 80 acres set aside which included all the mortalizable trainings. The following year (1911) the dense expetation which had overgrown the city after a bandonness in the sixth century. A D was cleared away. The importance of this step cannot be overcrimated since the monuments were in constant danger of destruction from failing trees many of which exceeded 156 (See in height).

exceeded 150 feet in height.

The systematic executation of Quirigum however was not commenced until the present year (1912) and it must be still be until the outset that the fines dread it works to the time dread of the work. In first place selected for executation was the mound on the south side of the Tampis to curr A few preliminary traches made at this point the var before and established the fact that this mound was the remains of a structure of very considerable importance. Much seculptured stom was strewn around it on all sides and fragments of a hier keybic inscription in cluding a date were received in the test.

diggings. This seemed a most promising field for the inauguration of the work

Various correlations of Mave and Christian throsology have been proposed from time to time them file Percer Prof. Educate Selection and the common selection of the common selection and the common selection of the common selection of the common selection of the common selection proposed by the writer and his reason for dopting it will be found in Papers of the School of American Archaelogy No. 11 Sylvanus Cirawold Morky.

We have in the Mentern Hemisphere archae obufced relice of past obelitzations as interesting selectification as interesting selectification as interesting selectification as interesting selectification of the mean fitter which from the Car beloan Reg. Not until the prevent year run the epistematic exploration of pairingue loque. This is the Aris positority coordinates the control of the recention that has far appared. The suther vertice from full hand knowledge insummed, as he were a loading spirit in the vertice—Barrent and selection of the two of the summed.

and a start was made here early in February From surface indications this mound appeared to be 105 feet long and 32 feet wide It rose from a platform or substructure the top of which itself was 20 feet above the general ground level

Before actual digiting could commence it was first uncreasory to build a trestle to support a transway by means of which the dirt could be removed. A track was laid along each of the long sides of the buildings so that the work of clearing it could proceed from both sides at the same time. As excavation proceeded, the ground plan of this once impeding structure, as well as its nature and use, gradually unfolded themselves, it was symmetrical in ground plan and centained

It was symmetrical in ground plan and contained seven rooms. (See Fig 6, where a map of this building Structure 1 is shown) Entrance to these was gained by three wide doorways—10 feet wide each—in th north facade, which gave tho chambers 2, 4 and 6, respectively The remaining rooms were entered from clambers 2 4 and 6, chamber 1 from chamber 3, and 5 from chamber 4, and chamber 6 from chamber 6. Three wide exterior doorways appear in Fig 2, which shows Structure 1 rising from the terrace at the back

These doorways were of great interest. The wall

These doorways were of great interest. The wall intrough which that pass is 8 feet in thickness, and the floors of chambers 2, 4 and 6 were in each case 2 feet higher than the floors of the doorways leading into them This 2 feet rise was effected by a single step, the front or face of which in each case presented a band of hieroglyphs. (See Fig. 3, where the doorway leading into chamber 4 is shown). The band of these typhics, against which the pick is leaning, is the top course of this 2 foot step, and, as appears in the figure, predects slightly beyond the courses below if Chamber 4, but partially excevated, appears in the background These three wide doorways with their literoglyphic steps give to this building, even in its desolation, a rare touch of dignity

The floors of the interior rooms chambers 1, 3, 5, and 7 are 18 inches above the floors of chambers 2, 4, and 6, from which they are requestively entered.

from which they are respectively entered.

The rooms of this building average tweive feet in length, and are about half as wide. Although the ceilings have in every case failen, their original height may be very clearly estimated at about 10 feet. Floors, walls and ceilings have never overed with a hard, white time plaster which still adheres in many places. Mo traces of wall paintings were found, though their basence may well have been due to the excessive rainfall—over 100 inches annually—to which this region to have thus decorated their walls.

Along the back (south) wall of chambers 2.4 and 6. Along the back (south) wall of chambers 2.4 and 6.

to have thus decorates their waits.

Along the back (south) wall of chambers 2, 4 and 8, there were low shelves, about 4 inches wide and a foot in height.

(See Fig. 4, where chamber 2 is shown.)

Note the shelf running across the back wall. These shelves were covered with

Note the stell running across the back wall. These shelves were covered with the same white lines plaster as the rest of the interiors. In so case was any object found standing us them. In chamber 2, however, the framents of a fine fluste lowl were found on the floor just against these were the parts probably steed on the shelf wall, and the bowl of whigh these were the parts probably steed on the shelf wall, and the lower of the sand broken when the roof fell in. Chaptless 1, 3, 6, and 7 justeful absoluted.

......

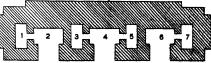


Fig 6.-Plan of Structure 1 with the chambers numbered

remain of the stillding-at a her fact above the foot, were base as also hade shown in the or of Fig. 8. When the roof one fall in the tenons attack and so the well were broken, of the room. Two similar to the found on the found of the mil the broken butte of the tenons had field them in the wall were position when this room was

"When Structure I was complicitly ex-centivel its became apparent that it had been it temple rather than a palese or druttling type of extructure. Several dif-ferent particular in the second of the institution, on a high terrace, which occu-pied one whole side of the Temple Court, indigently of the ground plan—an altiest universal characteristic or Maya temples—urcoupt pointed to a building developed to religious rather than to civil purposes. cture I was co

sin, the fact that chamber 4, the middie room of the structure, was differentiated by its decoration from the other rooms—i. e., in having three heads ten-oned into its back wall—seemed to mark it as the sanctuary proper, while the find-ing of a dosen or more bowls in an adjoining room, chamber 5, may well be ex-plained on the ground that these vessels had been used in the temple service. The identification of this structure as a tempie is further confirmed by certain of its architectural details. The only three en-trances by means of which this building can be entered give into the only t across their back walls. These low shelves are admirably fitted both in character and are summany need both in character and position for the offering of sacrifices. In-deed, in chambers 4 and 6 it would seem as though the heads which were origin-ally tenoned in their back walls may have as though the heads which were origin-ally teanoned in their back walls may have represented the very detties to whom the assertifices were offered. The width of the doorways giving into these three "shelf" or altar rooms is such—i. e, 10 feet—as to make the whole of their front sides open in each case, so that worshipers standing in the broad thresholds could easily see all that went on in the sanc-tuaries above and before them. The adjoining room or rooms with which each of these three sanctuaries is provided, afforded readily accessible places for the afferded readily accessible places for the storage of coremonate lobjects and relig-ious paraphernalia, as well as convenient rooms in which afficiating priests could clothe themselves. On the whole, the re-ligious character of Structure 1 can hardly be Goubted.

Refere discussing the histoglyphic inoned doorways, it is first necessary to add a word concerning the exterior of this building. ole common with almost all this building, eig common with almost all Mays attructures the figures was divided into two halves by a medial comice, which ran around the entire building about helf way, up the figures. In Structage 1 this medial counties was compected of a hand of historylyphics. (See Fig. 1, where the metrhessism and of Structure's 1 is, shown with the historylyphic counter restored to

on Baserstyphine complex restorest to suppleme the Maria area, expressive ju-sued plane of temple type structure such plane of temple type structure in consumpty of ground plan was very classified to detailing type structures. In 18th better class, however, expra-paged plane are more frequent proposed plane are more frequent or a figurately in the crystal plane or a figurately in the crystal plane of the complex plane proposed plane are more proposed plane. The complex is the proposed plane of the company to proposed plane are more proposed to the complex plane and the complex plane proposed plane are the complex proposed plane are the proposed plane are proposed plane and the complex plane and the complex plane plan

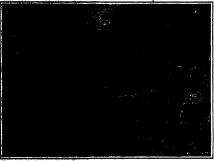


Fig. 2.—Structure I rising from terrace at the back, with Structure 2 in the foreground at the right.



Fig. 3. – Decrway leading into cham-ber 4, which is partially excavated.



Fig. 4.—Chumber 2 completely excavat-ed, showing shelf across the back wall.



Fig. 5.—Group of stone heads found during the exceptation of Structure L.

its original position.) The inscription be gan at the northeastern corner of the building, i. e., the corner shown in the above figure, and continued across the front and thence around to the starting point again. This cornice unfortunately was not in place at any point, but the writer was able to restore its first 18 hieroglyphics to their original positions, as appears in Fig 1.

So far as deciphered, this inscription records the date 9.19.0.0.0 9 Ahau 18 Mol of Maya chronology; that is the day 9 Ahau 18 Mol, the closing day of the

The katun was a Maya time period, which contained 7,290 days, and 20 katuns which contained 7,200 days, and 20 katuns composed one cycle. We see here then, that when Structure I was dedicated, i.e., 9,19,0,00 9 Ahau 18 Mol, a cycle was very nearly at its close, since one more katun added to the 19 here recorded made 20 katuns or another cycle. This was indeed the case, for the next katun after se here recorded ushered in cycle 10

of Maya chronology, i. e., the date 10,0,0,0,0 7 Ahau 18 Zip.

Passing now to a consideration of the texts in the three doorways; it will be found that the inscription in the eastern doorway opens with the date 9 Ahau 18 Xul. No record of the exact position of this date, that is its corresponding cycle tms date, that is no corresponding cycle or katum, etc., is recorded in this text, and to find its proper place in Maya chronology it is necessary to pass over to the inscription in the middle doorway.

Here there are recorded 40 days, writ-ten in Maya notation as two periods of the second order, i e, as two units, thus Following this number occurs the date 9 Aban 18 Mol. the same as appeared the outside of the building in the hieroglyphic cornice on which there was declared to be the date, 9.19.0.0.0 9 Ahau 18 Mol of Maya chronology. It is a conside assumption, therefore, that the date 9 Ahau 18 Mol in the middle do way was the same date as the date 9 Ahau 18 Mol outside, or 919 0.0.0 9 Ahau 18 Mol Fortunately, this important point is not left open to conjecture; since in the text in the western doorway the end of katun 19 is explicitly recorded. Moreover, having established the position of this latter date, the date 9 Ahau 18 Kul in the eastern doorway may be reckoned from it, by means of the days which are declared to have elapsed between the two

The dates on Structure 1, therefore, may be summarized as follows

Step in Eastern Doorway...(9.18.19.16.0)<sup>2</sup>
9 Abau 18 Xul. Step in Middle Doorway . . 20 9

(9 19.0,0,0) 9 Abou 18 Mol

Step in Western Doorway End of Katun 19 eroglyphic Cornice . 9 Ahau 18 Mol

Although the greater part of this in-Actionize the greater part of this in-scription yet remains an enigma, the chronological part as given above, may be accepted as final. Indeed, we may go a step further and analyze this part of the text somewhat as follows: Some important event occurred 40 days before the close of katun 19, at which time, and to commemorate which, Structure 1 was erected. This earlier and less important date was engraved on the step in the east ern doorway, and the distance from it to the really important date concerned here, i. e., 9 Ahau 18 Mol, the close of katun 19, was recorded in the middle doorway. In the middle and western doorways this important date is actually recorded, and it is again repeated in the most conspicuous place about this building, that is in the hieroglyphic cornice which ran around the outside.

The particular significance of this date

'Matter inclosed in parentheses does not appear in the text but is indicated by the accompanying dates

accompanying cares
'In Maya numeration only 18 units of the
2d order are required to make 1 unit of the
3d order Elsawhere however, in the lat,
3d and 4th places, 20 units are required to
make 1 unit of the order next higher.

### The Heavens in August

### Proper Motions and Stars; Changing Constellations; The Planets

By Henry Norris Russell, Ph.D.

As we gaze upon the familiar figures of the con-stellations, the thought may well impress us deeply that these same groups of stars, practically unaltered in position and brightness, showed themselves to the eyes of the builders of the Pyramids. From the standpoint of recorded history, the starry heavens are th liked and unvarying canopy which roofs in the chang-ing peoples and empires of earth

But will this be true if we expand our range of

thought to the scale of geological time, or even to lower extent which embraces the probable duration of lesser extent which emprices the promote outcation to human existence upon our planet? Suppose we might leap in an instant over a hundred thousand years, and look once more at the skies. Would we find then our familiar constellations? Which, if any, among them would still hear a recognizable resemblance to their

Bold as the questions may seem to be, modern astrononly is ready with the snawer. The positions of the stars have been observed for the past century with high exactness, and their motions calculated with such precision that they may be predicted (in general) for even one hundred thousand years in advance with as great accuracy as they could be plotted by the most careful eye-estimates or laid down on any star-map of

ordinary size.

The accompanying illustration shows the results of such a study of the brighter stars of the constellations Scorpius and Sagittarius, which are now so conspicu

ous in the southern sky. The outline of Scorpius, on the right, and the "Milk Dipper" in Sagittarius on the left, can at once be recognized. The arrow at tached to each star shows the direction and amount of its apparent motion in one hundred thousand

cluded. It is evident that the Milk Dipper will have lost all traces of its present shape, and that the whole constellation of Who be constellation of Sagittarius will be quite unrecognizable. This is what we would find in most other constellations.

Scorpins affords a very

interesting exception to general rule of its stars-notably Enstion Scorpit, near the mid-die of the constellationare moving at a relatively rapid rate, which will carry them almost out of the region now regarded as belonging to the Scorplon. One or two at the extreme southwestern ex tremity are moving so slowly that they will be almost in their present places a hundred thousand years hence. But the ma-jority of the stars show a vet) conspicuous tendency to keep together in their motion. The eight bright stars in the upper part (including Antares) will be st exactly the same relative configuration, as now, though about a de relative configuration then gree farther south

components of the maked-eye double  $\mu$  (shown us a single star on the diagram, next below the rapidly moving  $\epsilon$ ) and the conspicuous stars  $\lambda$  and  $\epsilon$  at the tip of the tail, evidently share in the motion of this group. as does Theta Ophiuchi, farther to the north, and also a number of fainter stars, not shown in our figure

So many of the stars of the constellation are involved in this common "drift," that the figure of the Scorpion will still be recognizable, even after the other stars with aim or recognizate, even after the orientation which are at present counted as belonging to it have moved clear away into other constellations, and the "bead" at least should be recognizable even half a million years hence. Hardly any other constellation will last as long, excepting Orion, all whose princi-stars are inoving even more slowly than those

Such a remarkable community of motion among the stars of a well-defined region cannot possibly be the



Proper metions of stars in Scorpius and Sa gittarius in one hundred thousand years

result of chance. It requires only a glance at the diagram to convince anyone that they form a real cluster. are relatively near one another (compared with their distance from us), and are moving together in the some direction. This is in fact the most conspict

measurements of the radial velocity of many of the stars, which (after applying certain corrections, the n for which has been shown by Prof. Campbell's at that ther are all approaching one system slewly, at average rate of about four miles per second.

This, as well as the other facts regn Tang, as west as to concer near example, as the spirit can be explained on the assumption that the skirs composing it are practically at rest in space, and their apparent motions are really due to the sunt motion. This makes it possible to calculate the distance tion. This makes it possible to calculate the substance of the group, which comes out rather more than a hundred light-years. At this distance the sun who utberly invisible to the naked eye—fainter, in face than the ninth magnitude. The completions stars of the cluster must, therefore, be of great brightne M. A11 the cluster must, therefore, or of great organizations. Those shown on the diagram exceed two hundred times the brightness of the sun, while most of them meat give out fully five hundred times, and Antares not less than two thousand times, as much light as the ruler of our system.

The Heav

Our map shows the aspect of the evening sky, and requires little explanation. Scorpius and Segittarius, of which we have been speaking, are conspleuous in the south and southwest. Above them is Ophiuchus, the south and southwest. Advis in Southwest then Aquita, with Cygnus and Lyra overhead. Hercules, Corona, and Boötes are in the west, Draco and Urea Major in the northwest, and Perseus and Cassiopels in the northeast. Aries, Pisces, and a part of Cetus

> with Audromeda and Pegasus above them. Aquar-ius, Capricornus, and the Southern Fish in the south-

The Planets.

Mercury is evening star
until the 22d, and morning star after that date, but is not very well placed for observation even at the be-ginning of the month. At this time he sets a little after 8 P. M. and may be secu in the twilight, but by the 10th he gets too close to the sun, and too far south, to be eastly and remains invisible through the mouth.

Venus is theoretically an evening star once more, in the latter part of the month (though she sets se of her great brigh

Mary is still an evening star, in Leo, setting about 8 P. M. in the middle of the west at dark to be easily seen.

Jupiter is in Scorpio. and comes into quadrature with the sun on the 30th. He is a splendid object in the evening sky, but sets before midnight. is on the opposite side of the heavens, in Taurus. He is in quadrature on the 27th, and rises a little before 11 P. M.

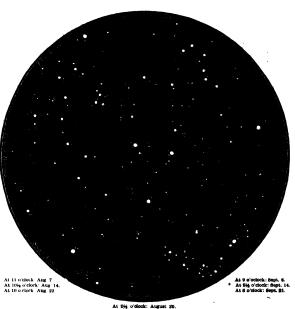
Uranus is in Capricornus, and crosses the meridian about 10 P. M. in He may readily be found

the middle of the month.

the mindle of the mount. He may readily be found with the aid of the maps published in previous issues. Neptune is in Gennin, rising about 1 A. M.

The moon is in her last quarter at 10 P. M. on August 5th, new at 2 P. M. on the 18th, in her first quarter at 11 A. M. on the 18th, and full at 2 P. M. on

quarter at 11 A. M. on the 19th, and full at 2 P. M. on the 27th, this is nearest the earth on the 13th (high tides again expected) and farthest away on the 29th, She is in conjunction with Jupiter on the 7th, Neg-tune on the 19th, Yeons and Mercury on the 18th, Mers on the 16th, Jupiter on the 19th, and Uranus on the 24th; none of the observable approaches being class. ceton Observatory.



NIGHT SKY: AUGUST AND SEPTEMBER

example in the heavens of the "moving clusters" of stars, of which so much has recently been heard in the astronomical world, and its nature has been pointed out independently by several astronomers—Prof. Kap-teyn, Mr. Eddington of Greenwich, and Mr. Benjamin Boss of Albany. This is not all. It is perceptible, even on the diagram, and evident from an exact study of the stars' motions, that the easternmost stars of the of the stars' motions, that the easternmost stars of the cluster appear to move in a direction decidedly to the east of south, while the westernmost are going almost due south. The obvious explanation is that the cluster is approaching us, and hence appearing to grow larger and spread out. This is confirmed by the spectros

# The Business Aspect of Synthetic Rubber

What are the Prospects of the New Discovery?

By Prof. Dr. F. W. Hinrichsen, of the Koenigliches Material-Pruefungsamt

A T this great jubiles meeting of the Society of Ger-Flagan Chamista, which took place at Freshurg im Bredgard, ast Whitmantick, the attention of the general justic was drawn to the question of the synthetic germinence in this shock, row overker of special germinence in this shock, Prof. C. Harries, of Kiel, and pp. F. Hofmann, of Ethership, driving a comprehensive amount, from the actentific and tectuloni standpoint, so the present earts of the problem.

"Only research Prof. Perkin, in England, has read a pager on the same subject, and has given publicity to sign results for research in this field. While, however, the two German investigators mentioned above weep very gearded and siespident in their expressions relating to the future of synthetic countrhoop, and regarded the time when synthetic rubber will appear spout the instrict as still far off, the locture of the England chamits was more optimistic. The result was that a sompany with \$2,500,000 was immediately founded, which counts some girt bear of directors no less a chemical authority than fit William Riamany, while fit William Riden has been retained as consulting chemist. Nevertheless, the opening of the list for subscriptions for shares, so far as we can judge from report, assess to have been a comparative faiture, only a very mail amount of capital having been sunkein the new foundation. The conservatiam displayed in this case wen the new results communicated by Prof. Ferkin do not by any means justify the highe that any considerable quantities of synthetic countrious will be produced in the near future.

From the extensitie of anythetic countrious will be produced in the near future.

From the scientific strandpoint, the question of conoutcounce synthesis is clear at the present time. It is well known that consichoue is formed from isopreso, a compound of carbon and hydrogen, obtained as a mobile, coloriess liquid of low bolling point (28 dags Cent.), for example on heating countchoue itself or turpentine. As was first shown by Hofmann, pibbleslike bodies are also obtainable from other compounds of carbon and hydrogen besides isoprese, which, however, must have a somewhat similar chemical constitution. Among them may be mentioned the hydrocurbon butadiene. The transformation of such compounds into countrious can be effected either by simply heating under pressure with or without the additiou of other substances (Hofmann) or by the influence of small quantities of metallic sodium (Harries); the products obtained differ entirely in their properties, according to the nature of the initial material employed and the conditions of transformation.

In order that synthetic rubber may be capable of competing successfully with the natural product, it must be equal to it in technical use and must be at least as cheap to manufacture.

As regards the first question, there can hardly be any doubt that in the course of time it will be possible to produce rubber by artificial means which will be equal or even superior to natural rubber in sechsical use. We have not, however, as yet arrived at this

The price of synthetic rubber, on the other hand, depends, in the first place, on the cost of production of the initial material, isopresse, and silted hydrocarbons. Here also it can hardly be doubted that before

The author of this article recentity completed for the Koenigliches Material-Prunfungsomt at Lichterfelds a very elaborate leuocitystom of rubber. No man is better qualified than he to discuss the technical and commercial significance of the discovery of synthetic rubber made by Prof. Perha. While the Bibliot obecome to took either to delened from Prof. Hisrichem's argument or to assist the subcheelings transactions of the English company fernical to applied the new discovery, it seems ashly fift's popied soit that in the prospectus of the English company it is clearly set forth that the immediate purpose its on manufacture fused oil and acctome, and that part of the proceeds assured in this song are to be decord to research on a factory scale upon the new rubber process.—
Borron.

very long processes will be found which will yield these substances more cheaptly than methods known hitherto. At the present time, however, there is no such method known for isoprene, the parent substance of natural rather. The problem is rendered particularly difficult through the fact that the substances employed must be specially pure. Most of the processes, proposed hitherto do not yield a pure isoprene, but matriures of different hydrocarbons of similar counttution. Mofeman himself, in the preparation of pure isoprene, stars from a countituent of coal tar, namely, creed; but in this process size, so far as can be judged at the pressuit, the cost by production is considerably

greater than for natural rubber. But even if it should be possible to prepare suffi mantities of isourene at a sufficiently low cost, the quantities or isoprese at a successity low cost, the difficulties of the problem, as Hofizant has pointed est, only begin, for the yields are comparatively small in all mathods of this kind. Consequently, in technical prefearction on a large eagle, such as is implied in case serious competition with the natural product should series compenion with the natural product should be contemplated, such enormous quantities of by-prod-ucts are obtained, that their disposal or utilization would probably present a more difficult problem from would probably present a more difficult problem from the economical and technical point of view than manuare of the enoutchouc itself. How is it in this regard with the new process communicated by Prof. Hofmann, and so hastily made the basis of funncial operations? The principle of the new method of producing synthetic enoutchouc depends, on the one h ducing synthetic executions depends, on the one mand, on the cheap production of hydrocarbons which can be used an initial materials for rubber; on the other band, on the acceleration of the conversion of these hydrocarbons into rubber-like substances. Prof. Fernbach, of the Pasteur Institute in Paris, has shown that starch (obtained from potatoes by maine) can be converted by means of yeas-like fernments into a mixture of fusel oil and acetone. From these compounds, the hydrocarbons required as raw material for the caoutchouc can be produced by suitable chemical tran matton The transformation of these substances into rubber-like bodies is effected by means of metallic sodium; that is to say, by the same means as discovered and used independently by Harries. According to Perkin's communication, this method was discovered and made the subject of patent application by Matthews half a year before Harries, though no publication was made of the fact. It must, therefore, be admitted that the priority of invention belongs to Matthews.

The use of starch as the initial material is alluring at first sight, owing to its low price. Whee, however, we examine the new process a little more closely, we examine the new process a little more closely, we cannot quite suppress doubts as to its financial soundness. An inquiry addressed to the highly reputed obtained in the several stages of the process, brought has following information. By Fernbach's process there is obtained from starch 42 per cent to 48 per cent crafe fused oil. The starch content of potatoes or mails to should 80 per cent. The "fused oil" Inself is said to contain only about two thirds of true fused oil, the rest being accome and other compounds. Furthermore, the fused oil gives a yield of 40 per cent to 50 per cent to begreen, which latter is converted without loss into rubber. According to calculations which the above-mentioned English technical journal made, 100 tons of starch will be required for the production of 1 ton of synthetic concuthous in this way. From this it follows that only about 1 per cent yield, figured on 5 synthetic concuthous in this way. From this it follows that only about 1 per cent yield, figured on 6 synthetic concuthous of this way. From this it follows that only about 1 per cent yield, figured on the starch, is family obtained, while 60 per cent of the latter goes into by-products. For the production of a quantity of synthetic rubber corresponding to the present world's consumption (about 74,000 tons), such an impasses surface would have to be planted with potatoes that the ground now occupied by rubber plantations would represent only a small fraction of this.

That such a process as this cannot be very practicable is obvious. Added to this is the fact that the proof is still owing that the material obtained by the English process fulfills the technical conditions.

As has been shown by Harries, artificial rubbers obtained by mesus or metallic sodium differ chemically from natural rubber. It is, therefore, not by any means probable, a priori, that the new products will be found equal in their mechanical and physical properties to natural rubber. The situation is randered still more difficult through the fact that the chief constituent of the product obtained by Fernance's se-called butyl alcohol, which, on further treatment, does not yield looprene, the purent substance of natural caoutchouc, but butadiene, which has already been referred to. We may, therefore, expect that the English process will yield substances differing materially in their projecties from natural rubber. In any case, their technical usefulness and value is still awaiting proof. On this point there is practically no evidence available. The invention is still in the laboratory stage. As we read in the India Rubber Journal, there have hitherto not been prepared more than one or two pounds of synthetic rubber by the newly described process.

There is, therefore, no doubt that the formation of the company is presentative. Synthetic rubbies will certailaly some, and will claim its piace upon the world's market, not suddenly, however, at one blow, but graduity. Even then it is not probable that it will ever completally displace the natural product, especially the plantation rubber. It is much more likely that some sort of equilibrium will be struck, similar to that which now exists with repart to artificial and natural sifk. In the field of technical progress, the law of inertia rules as in other domains.

The Increasing Temperature of the World A PROPHICY of what is claimed by many to be the Almereasing temperature of the earth and an explanation of the recent prevalence of hot summers is found in a volume written by C. B. Van Hise, president of the United States Geological Survey. In this book A Treaties on Metamorphism) Prof., Van Hise pointed out that the enormous burning of coal by usen meet steadily whithis the six by the discharge of carbon dioxide, and that this written must bring about a marked increase in the comperature of the globe. He says (pages 458-4681);

amoun for the future, and supposing the amount of carbon in this cost to dwerage 80 per cant, the quantity of carbon which passes time the atmosphere would be 2,983,383,000 metric tens per annum. This is 0,1283 per cant of the total amount of carbon at present in the atmosphere. If this rate of consumption of coal were continued 812 years the amount of carbon in the atmosphere would be doubted.

"It therefore appears probable that within a comparatively short time in the future, as compared with a single geological period, or even an ejech, the amount of carbon in one of its great reservoirs, the atmosphere, will be increased to an important extent. From this fact, various geological consequences are likely to follow. One of the most important of these is a higher average taugarature for the globs. According to Arrhenius, if The earthon divide is increased 2.5 to 3 times its present value, the temperature in the Arctic regions must rise 8 deg. to 9 deg. Cent. (14 deg. to 15 deg. Faihr.) and produce a climate as mild as that of the Rosens parietal. According to the above computation, the earbon would be increased by the oxidation of

coal alone to three times its present amount in one thousand six hundred and twenty-four years.

"A further consequence which would follow from an increase in the amount of carrion in the atmosphere and the warmer climate would be a much more abundant and widespread vegetation, and more vegetation means that when oxidized more carbon dioxide will be concentrated in the soil, and this concentration will lead to an acceleration in the rate of carbonation Furthermore, the increase in average temperature of the globe will accelerate all other chemical reactions of the belt of weathering. It therefore appears probable that sentitled a viduality of our will result in some of the most profound and far-reaching geological consequences which are due to the agency of man."

Since this was written the world's annual consumption of coat has about doubled, so that Art thousand infilion tons of carbonic oxide are now being annually discharged into the atmosphere. In view of this fact, there is little wooder that Prof. Van Hise's proponentications in regard to the increased temperature should have been a mitter world's.

### Curiosities of Science and Invention

#### A Land and Water Cycle

ARESIDENT of Oakland, California, A owns a contrivance of his own making which it is claimed will convey him over land at a rate of twenty miles per hour and on water at the rate of fifteen miles an hour. The device he calls a hydro-motorcycle it consists of a motorcycle equipped with two canor-shaped metal floats, each fourteen feet long and about arteen inches wide feet anne is divided into three airtight compartments and is fastened on a light steel tube frame. When traveling over land, the floats are evenly balanced, as they are carried one on each side of the motorcycle. When it is desired to make a water craft of the motorcycle, the make a water cratt of the motorcycle, the two floats are simply reversed on their images and clamped down by a simple device. The propeller which, when not in use, is carried behind the seat may be dropped down into the water to propel the craft. The propeller drive contains a statch which converts the reverse with a clutch which connects the power with a 3-foot propeller shaft of %-inch steel. The propeller has three 12-inch blades. Steering is effected by means of two small redders, one on each of the floats, and both connected to the handlebar of the motorcycle. The total weight of this amphibious volucie is 425 pounds, of which 225 pounds represents the weight of the attachment

#### Amateur's Star Finder

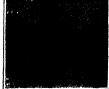
AN astronomical instrument of great Aprecision and remarkable simplicity, enabling any layman to ascertain the names of stars of constellations observed in the skies, and inversely find any star whose name or position has been given, has been designed by F. Sartorius of Göttingen The star finder consists of a star map which may be adjusted to the geographical latitude of the place, and, a diopter pointed toward the star to be determined. Actutoward the star to be determined. Actu-ally the device consasts of an equatorial mounting, similar to that of a telescope. The main stand is a tripod provided with a spirit level for adjusting the head to hori-zontal position. The stand carries a graduated are for setting the axis of the sta to the proper angle of inclination. be understood, of course, that the axis must be parallel to that of the earth, so that it will point to the North Pole of the heav-The angle of inclination, therefore, is that of the latitude of the place. For in-stance, the latitude of New York is about stance, the latitude of New York is about 41 degrees north, consequently the axis would have to incline 41 degrees from the horizontal. A compass is provided for set-ting the axis in the north and south plane. The star map, then, will be in the plane of the celestial equator. Mounted to rotate over the surface of the star map are two arms which cross each other at right angles. At the end of one of these arms the diopter is mounted, so that it may be rotated in a plane at right angles to that of the equator. The star map is provided along the circumference with graduations which indican the right ascension of a star, also with a scale which shows the daily and monthly displacement of the heavens to be ac-counted for — in using the apparatus the hourly advance should also be followed continually. The diopter is swung bodily about the star map, until the arm that lies at right angles to its axis comes in contact with the star on the map whose position in with the star on the map whose position in the heavens it is desired to find. Then the diopter is swung to the proper angle of declination of the star as indicated by the graduations on the arm, when, on looking through the diopter, the star will fall within the field of observation. This instrument will doubtless be welcomed as an excellent means of getting an insight

#### Who Owns Spitzbergen?

THIS question is often asked nowadays, in view of the remarkable development of these Arctio islands. A conference to sattle the question has just been held between the governments of Russia, Sweden and Norway. A convention has been

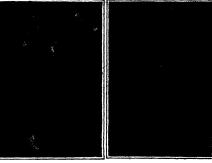
READERS are invited to contribute to this department photographs of novel and curious objects, unique occurrences, and ingenious contrivances. Such as are available will be paid for promptly.





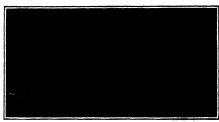
The floats folded up for land travel.

A spin on the water.



An instrument for locating and identifying stars.

Apparatus for scaring sheep togeth



Wild boar group in the American Museum of Natural History.



Sixty-two pound leheter catch off the Highlands of New Jersey,

drawn up, in accordance bergen will be a neutral all nations, but governed consisting of one repri of the three powers abo will be levied by the bea

AN invention to protest sh Amronaut so protest sheep a inroads of wolves, coyotes a animals that prey tipon the berds devised by E. C. Winnhester of The devised by E. C. Winnhester of Ti lis, Wyoming, and his been protes sheep men of that region to be practical device for scaring away mais and keeping the sheep tog night that his yet been offered, chine consists of an automatis gr will shoot a blank cartridge every 30, 60 minutes, as arranged, while a built lantern is so adjusted as to revolve fash its light in every direction. It may be a so that the light in every direction. more than one revolution a minute. ating by means of a coiled spring and sting by means of a colled spring and one-wheels, a sort of clockwork, in fact. The mechanism is inclosed in a storm and dust-proof metal case and mounted on four ad-justable legs. It has a weight of 35 jounds, so that it can be carried with the sheep-man's outst with no difficulty.

#### Wild Boar Group in Roali Surroundin

A NOTEWORTHY wild bear group, the first of its kind to be seen in this country, has recently been placed on exhibition at the Museum of Natural History, New York. A colony of nine History, New York. A colony of nine animals, old and young, have been realistically grouped so as to represent a babitate some in winter in the forests of Germany, with a pasinted background of mountains. The group measures 8 by 15 feet. The series of fine boar skins was precented to the museum by Mr. Walter Winnes, who is a noted sportnensh, hunter, and horseman. The right foreground is occupied by two of the largest male boars, depicted in a florce battle, a number of young ones are seen bline on the series. depicted in a fleroe battle, a number of young ones are seen lying on the ground, while other still larger ones are standing in the near distance, whothing the out-come of the combat. The spirited and lifelike modeling of the admals and the mounting was executed by Mr. Frederisk Blanchke, the animal southor of the museum. The group is considered to be one of the finest and most up-to-date examples of the new plastic taxidermy.

### Two Record-holding Lobsters

WO lobsters that are claimed to hold TWO lobsters that are claimed to hold the world's record for size have just been mounted and placed on exhibition in the Museum of Natural History, New been mounted any pasces on examinant in the Museum of Natural History, New York. The harger specimen, the one on the right, weighed, when alive, 36 pounds and was nearly three foot long; the other one weighed 28 pounds, Both of these mouster lobstars were caught off the Highlands of New Jersey, where they are said to have played havon with the lobster traps, cutting boles in them and robbing them of all the bair, as their bodies were too large to get inside. Finally they were hauled up to the surface dinging to a trap. The larger spellmen showed many agen, evidently from savage combests. The langer that is estimated to have been fifty yours as the average age. The length of its life is estimated to have been fitty remarks and are average ago of the property of survival in the lobster or about 2 is \$0.000 ergs. Owing to over-fashing and lineal destruction of the exp-essuring females, etc., large lobsters are fast disagnessing, or the property of the property ary at Wickford.

### **Inventions** New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

First the New England blueberry is finity famous, its systematic cultiva-tion, shall recently, has been neglected, largely shrough the belief that it was im-

age bushes in the grounds of the managed in the country special of the country special business in the Arnold Arboretum of Boston demonstrate the fallacy of the des that the blueberry cannot be trans-dented and cultivated.

Some years ago Dr. Frederick D. Coville, singlist in charge of Taxonomic and ange Investigations of the Department Agriculture, started upon a series of in-vestigations of the culture of the berries. vastigations of the culture of the berries, which has continued to the present time with somewhat remarkable results. Pro-cessing with the idea that previous failures along the same line had been due to a misascen care same one nad over oue to a mis-understanding of the soil requirements of the blueberry, which are radically differ-ent from those of our common cultivated plants, the Doctor, whose interest in the subject was attracted as far back as 1906, has made a scarful study of the soil requirements with important results. It is evident from a consideration of what he has secomplished, as fully set out in a bulletin of the Bluesse of Plant Industry of the Dopartment of Agriculture, that the problem has been presideally solved. As each advance in the site and exicuses or exactly a condition, or conditions, and these make deimpands upon the creative faculties, the Doctor found it necessary to devise a gage. This haudskiberryometer, or hiu e berry gage, as it is more procateally known in the dispartment, is used for measuring the berries and in noting the progress of the culte, the Doctor, whose interest in the rries and in noting the progress of the cultivation. The possibility of culture has not only been demonstrated but the size develonly been demonstrated but the size development as well. Starting with a normal size of the opening No. 11 of the gage, the berries have been developed to size No. 15 and doubtless a further oultivation will result in a much larger size, the flavor and fruitiness of the berry being improved.

### er than impaired, by the cultivation. Some Interesting Toys

TOYS, especially toys in the form of dells, are interesting to most people, and we sometimes find a toy that combines and we sometimes and a toy that combines the utilitarian with the amusing. Thus Mary L. Rusk of New York city has pat-ented a water bottle, No. 1,026,460, in which is combined a hot water beg and a cover in the form of a doll, the dress of the cover in the form of a foll, the dress of the doll extending over the hot waster bottle. By this construction, as the patentee ex-prehense it, there is provided a hot fluid con-tainer which by reason of its appearance will be attractive to a child so that a child will permit it to be placed near it. Thus the child in taking the doll to bed with it will also have a bed warmer at the same

J. G. Hamley of London, England, has

#### the Californied Blueberry A Tablet Sorting, Counting and out a large number of operations from a placing the operator in order to send out Filling Machine

By the English Correspondent of the

preparations in a compressed tablet against the action of continuous streams of impedious apparatus for make resulted in the evolution of an aparks such as the anamy missing and the streams of impedious apparatus for managements apparatus for management apparatus fo form has resulted in the evolution of an ingenious apparatus for sorting, counting in times and packing these preparation, which is the continuous sparks, and having any shown in the accompanying illustration, action upon the apparatus, in the case of The machine is the invention of Mr. fifting a submarine min, for matance, but The machine is t Eduard Naumann,

of Göthen, Anhalt, Germany, and has been in operation in one of the largest Berlin manufactories for several months past with complete tablets are poured into trough-like kopper, which is fitted with a specially con-structed roller for ting off the supply and which per a certain number of the pellets to be carried on to an agitator which sifts agitator ... off the adhess ler. The tab-



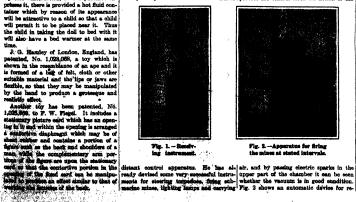
forward automati-cally on to a grid where the imperfect ally on to a grabere the timperfect tabloids are rejected. The whole is so combined time where the timperfect tabloids are rejected. The whole is so combined time where the disk does nothing but rotate forward and back under the standing where the disk does nothing but rotate forward and back under the standing where the disk does not the standing where the counting mechanism where, by means of a peculiar movement, the required number to enter the bettle or box are counted off and emptied into the receptacle. The count-ing device can be altered so that any number of pellets as desired may be passed into the ve el. A short pause is then made to allow the charged bottle to be removed, and an empty receptacle substituted at the mouth of the machine

The apparatus can be worked either by motor power or by hand. It has been found to be thoroughly reliable, exact, and efficient. In a working day of seven hours some 200,000 tablets can be sorted, sifted, ounted, and charged into hoxes or bottles.

#### Firing Submarine Mines by Wireless Telegraphy

DR. BRANLY, the well-known French





distant post by sending out suitable wave signals for firing the mine at stated inter-signals as in wireless telegraphy. More vals. A cam works upon a rotating disrecently he has brought out the apparatus for this purpose, and the signals can be which we illustrate here, and it is intended varied by changing the notches upon the

other hand, will be structed. powerless to carry out any operation of the kind. Dr. Branly's protecting on by distant waves.

The rotation of the disk causes a series of electric contacts.

cease, the operator has time to s sertain spark signals, which act upon the disk and its electric contacts in such a way disk and its electric contacts in such a way that the mine is fired. These signals are combined in such way that they are known only to the operator. In the present apparatus, the waves are received by a new type of coherer illustrated in Fig. 1. It is a modified form of Dr. Branly's tripod otherer, A, at the lower part. It is fitted on an upright support and from this three on an uprigate support and from series arms, B, hang down by means of pivots.

The sems carry well rounded steel projections which bear lightly upon the cylinder uons which bear ignity upon the cylinder so as to make the coherer contact. One wire, C, comes in at the top and the second wire, D, is connected to the steel cylinder through the base, M. The whole is inscientiat, has been engaged for some closed in a vacuum chamber in order to time past upon various kinds of wireless protect the coherer from the action of the

A cam works upon a rotating disk

room having any status, in the case of hear fatter, the script, be dependent of the case of hear fatter, the script, producing a fattliess document short time, the surpty, producing a faultiess document of home operator can without any trace of correction in any now send out a special signal which a terman inventor, Mr. Oswald Poppe, will fire the mine The enemy, on the tem patients of Gora, has schewed. His invention has the control of the control o

The apparatus forms the table of an ordiary typewriter with which it may be so connected as to allow of its being dismounted at any moment Whenever the typewriter has produced a defective manudevice some a horizontal disk sorpe to a horizon inserted are then written at the end of the manuscript or on a paper tape placed under-neath, a correcting key being again pressed down before as well as behind these The defective and corrected manuscript having then been removed, a new sheet of paper is put on the roll, after which a spring is wound up or some other motive force applied. The typewriter new prepares automatically a new faultless manuscript at high speed where there are no gaps, the lines being divided automatically at the end of syllables The typewriter can thus be allowed to continue its work, producing any number of identical manuscripts, and any number of mention manuscripts, and inscribing, if required, automatically, a different address on every copy. The manuscripts thus obtained are not distinguished in any way from hand-type documents. The output of the machine can of course, be multiplied by producing carbon conies.

producing simultaneously with the manuscript a small pattern of plain paper which is about the same size. Each letter is marked in this pattern by two or three neat holes arranged in lines, which allow the letter to be reproduced on the keyboard. Leaves of patterns can be filed for reference or later reproduction.

The same principle can, of course, be applied to type-setting machines.

#### A Money-washing Machine

THE United States Government recently installed in the Treasury Department for experimental purposes, the machine for renovating bank notes and other bills recently described in these columns. The machine is about fifteen feet long and includes flexible belts moving face to face and properly manipulated to secure a scrubbing action upon the bills. The bills distance of from 60 to 70 feet in passing through the machine and in such presents surveyed the machine and in such course pass through a washing solution, a germiede mixture and a starching or stiff-ening preparation, and are finally ironed and discharged in appearance and crispness practically new bills The cost of producing a thousand bills is nearly fifteen dol-lars, while it is estimated that the cost of renovating bills by the machine in the manper described will not exceed in the neighborhood of fifty cents per thousand.

#### The Trade-mark as a Business A By W. E. Woodward

ht. 1912, by Manu & Co

THE average business man has only the rass average outsiness man has only the mark. He does not realize that it is very often the connecting link between the pro-ducer and the ultimate consumer; that it is a symbol of good will, a tangible asset with a determinable money value, that it mus a determinable money value, Inal W muse be chosen and applied not na a haphasard way but with a due regard for its psychological effect upon the public. Nor does he realize the importance of complying with the statutory requirements which secure to

the statutory requirements which secure to him a property right in a truste-mark com-parable with the property right that as inventor acquires by taking out a patient. The following is the fourth of a series of articles, written by a man who is at once a trade-mark, an adsertising, and a busine ness expert, a man who has a first hand knowledge of the value of trade-marks and of the correct methods of trade-mark exploitaof the vorrect methods of trans-mark expansi-tion. The series, which will be eventually published in book form, will include dis-cussions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elem good trade-mark, and trade-mark pron.-EDITOR.]

#### Analysis of the Requirements for Registration. -- IV.

ued from page 88, July 27th, 1919.)

Great care should be taken by an applicant for registration of a trade-mark, o mark that is already registered or already mark that is afreedy registered or arready in use (even if not registered) provided that it is applied to the same class of merchandise as that of the applicant. Lack of caution in this respect has caused interminable annoyance and litigation, with consequent financial loss.

In considering the question of conflict-ing marks, the Patent Office and the Federal courts hold that the test of similarity is whether the marks are sufficiently alike in appearance or wording, or sound, to mislead the average individual. The word "Autola," as a trade-mark for cugars was held not registrable, owing to a prior egistration of the word "Auto-do" the same class of merchandise. In this instance, registration was refused on the instance, registration was redused on the basis of resemblance in sound as well as in appearance. "Lady Lee" having been registered as a trade-mark for shoes, "Lady was refused registration in the san "Certose." as a mark for a brand of flour, sufficiently resembled "Coresota"
—already registered—to cause its rejec -aiready registered—to cause its rejec-tion. "Powellton" failed registration as a trade-mark for coal, on the ground that another company's coal already bore the registered mark "Powell's Run." "Sodafoam" was considered close enough in resemblance to "Sea Foam" (already registered in the same class) to cause its re-jection. "Uno," having been registere having been registered as a trade-mark for a medicine, an appli-cation for the registration of "Ino" in the same class was refused.

me class was refused. Registration is refused a trade-mark it consists of words describing a when it consists of words describing a symbolic or pictorial device which has already been registered; or vice versa, when the wording has been registered first registration for the symbol is refused. For instance, the Patent Office has held For instance, the Patent Office has held that a trade-mark consisting of a con-ventional representation of a bouquet of flowers is identical in meaning with another mark consisting of the word "Bouquet," applied to the same class of merchandise either case, the goods would be called Bouquet Brand.

ement among owners of conflicting irks is not recognized by the Patent Office An interesting example of this occurred in the attempt to register the word "Nayassett." The word "Nassao" ady been registered for the sam class of goods, and the registration of "Nayassett" was refused on the ground of similarity. Soon afterward, the owner of the "Navagett" mark made new apthe law did not provide for agreemen between owners of conflicting marks, and the registration of "Nayassett" was red accordingly.

Iused accordingly.

About two years ago a manufacturer in a middle Western city became interested in a new metal polish and decided to put it on the market. After long consultation with advertising men and sales men, a name was selected. This name men, a name was selected. This name was suggestive and short, with a snap to it that made it stick in the memory. Thousands of labels were ordered and packages of the article were given to the traveling salarmen of the concern to be travening salesmen of the concern to be used in getting orders from retailers. Booklets and literature had been written and mailed, and the business was begin-ning to take shape when, to the surprise of the manufacturer and his associates, his application for trade-mark registration his application for trade-mark registration was rejected by the Patent Office for the reason that the mark had already been registered. Then followed a hasty trip to a trade-mark attorney, and a search of the Patent Office records was made. Investigation of the register showed that the same name had been registered by an the same name had been regulared by an Eastern concern for a metal polish some years ago. About this time, a letter arrived from the attorney of the Eastern firm, with a statement to the effect that the owner of the trade-mark considered this unauthorized use of the mark an this unauthorized use of the mark airfringement and intended to take legal action in the matter. A month or two was spent in trying to make some arrangement with the Eastern concern, with the final result that the trade-mark had to be dropped and something new devised. In this case a full year was lost, and a considerable amount of money was wasted, by reason of the failure of this manufacturer to have a search made of the Patent Office records. He made the mis-take of considering the matter of trademark registration a small detail, and try-

mark registration a amail detail, and trying to attend to it himself. A competent
attorney would have saved his foe a
thousand times over in this caso.
A trade-mark consisting of the insignia
of the American National Red Cross is
not registrable. This prohibition is not
covered by the trade-mark law, but a one of the provisions of the act of Con-gress incorporating the American National Red Cross (approved January 5th, 1905). This act of incorporation states that it shall not be lawful for any person or shall not be lawful for any person or corporation to use in trade, or for pur-pose of advertisement, "the sign of the Red Cross" or "any inagmia colored in imitation thereof," unless such person or corporation was entitled to the use of such insignia at the time of the passage of the act. This exception, which was intended to safeguard the interests of those who had long used the Red Cross sign as a trade-mark covers the Red sign as a trade-mark, covers the Red Cross mark of the well-known druggists' specialty house of Johnson & Johnson, the Red Cross labels used on a brand of shoes made by Krohn, Feohleimer & Co. of Cincinnati, the Red Cross mattress manufactured by a Boston concern, and a few other users of this device. The law, as it stands, is rigidly enforced in regard to all new trade-marks containing regart to an new trade-marks containing Red Cross devices. An unusual argument was made the basis of an application for registration of a label for a cough syrup, on which the emblem of the R was printed, accompanied by the words "Red Cross." When registration was reused, the applicant sought to amend the label by striking out the Red Cross em blem, while leaving the words intact. He argued that the Red Cross incorporation act prohibited only the use of the "sign of the Red Cross" and not the words. The application was rejected on the ground that it was an attempt to evade the spirit

of the law. A trade-mark is essentially an exclusiv possession. When it ceases to be exclusive it cesses to be a trade-mark, in the true sense. It is apparent, therefore, that an ordinary word, descriptive of the goods with which it is used, cannot be set aside. of the "Nayassett" mark made new ap-plication, accompanied by the formal con-sent of the owners of the "Nasseo" mark as the exclusive property of any manu-The Commissioner of Patents held that facturer, to the detriment of others pro-

oing merehandi e of the same char thong merchantes of the mains management. The wording of the law on this point is clear, and the Patent Office is strict in its interpretation. But despite this con-The ion, many applications, destined to be dition, many appusations, usetimen to see rejected, are made every year for the registration of descriptive marks. We quote here a few examples of trade-marks refused registration on the ground of being riptive:

The word "Kantleek" was refused regis ation as a trade-mark for a hot-water ag. The Patent Office examiner held bag. hag. The Patent Umos examiner need that the word was composed of "Can't" (misspelled "Kant") and "Leak" (misspelled "Leek"), and that it was intended to convey the idea that this particular bottle could not leak. The attorney for notice could not least. The attorney for the applicant presented an argument to the effect that this word was composed of two German words "Kant" and "Leek," that had meanings quite different from the English words with the same sounds. This contention was too subtle for the Patent Office to grasp, and registration was refused.

The word "Naphtha," used as a nam

for a soap with naphtha as an ingredient, was held to be descriptive and therefore not registrable as a trade-mark, to the exclusion of the goods of other manu-facturers, although the owner had adver-

facturers, although the owner had adven-tised it extensively.
"Mello," as a mark for chewing-gum, was considered descriptive, being simply a misspelling of the word "Mellow."

(To be continued.)

#### Notes for Inventors

A Cipher Typewriter.—The cipher type-writer, it is said, is coming into vogue among diplomats and business men. It is a ne by means of which a me be written that can be read only by him for hose eyes it is intended.

Another Safety Appliance for Aeroplanes.

—In a patent, No. 1,030,312, Henry Laprise of Holyoke, Mass., presents an aeroplane which is provided with a recessed top forming pockets in which collapsible floats d, the floats being adapted are pac are pecked, the hosts being scapped to be released from the stowage spaces and hav-ing bottom openings so that they may be filled and expanded with air from below.

A Poison-indicating Bottle.—In a pat-ont, No 1,032,610, Emile A. Kern of West New York, New Jersey, presents a hottl for indicating poisonous contents, which bottle consists of inner and outer walls forming a chamber between them and a light-emitting compound in the chamber which chamber is entirely closed and pemanently confines the luminous comp

Primitive Lobster Traps.—If you ha ver been in the lobster country, you will doubtless remember the traps, all slike and all made of laths. Laths are almost legal Laths are almost lega tender with the lobster catchers, and this fact makes a lath-laden derelict cast up on the shores of the lobster waters especially desirable. The traps are not especially secure, as lobsters frequently enter, ea the bait, and if given enough time, escape and, possibly, some one acquainted with the conditions can devise a more efficient trap for the purpo

Two Hollerith Machines.—Herman Hol lerith of Garrett Park, Md., assignor to the lerith of Garrott Park, Md., assignor to the Tabulating Machine Company, has just soured two patents, No. 1.030,304, for a registering apparatus, and No. 1.030,305, for an apparatus for use in tabulating sys-tems. The apparatus presented in these systems is very complessed and is designed for use in the shulating and registering processes which Mr. Hollerith has done so much to develop. It will be remembered that Mr. Hollerith was among the pioneers in this art especially in the designing of machines for use by the Census Office in its stabulating operations. tabulating operations.

present for property and persons to be for a functional person which man be cealify apper the seed without street for manager, such as in is expensive, sue quickly pay for its

The Many Reads to Inve known inventor, who for many years invented along the same line and has a a great commercial success of his useful to-ventions, tells how he recently was led be make an important improvement in one of a great comme his machines. His young son asked how the differential gear of his autom how the differential gear of his automouses worked. Wishing to give a correct an planation, he looked up the technical feasi-ures of the transmission, and in doing as happened upon the very improvement as happened upon one very supervision had hitherto been unable to complete that largely by accident he was able produce a desired invention which sluded him when deliberately cought.

Wanted a New Method of Caring Pork.

—In a note from abroad, Constil Albert
Haistead of Birmingham talls how the increasing use of pigakin and its tendency to creasing use of pigakin and its tendency to advance in price has raised the question as to whether the great waste due to leaving the skin on becon, ham and other pork products can be avoided. The English products can be avoided. The English
Leathers Trade Review estimates that
there is a yearly loss of skins amounting to
about \$3,000,000 in the United Kingdom
alone. The waste of skins is evidently arone. The waste of arms is evicently unavoidable under present conditions; the difficulty is to find a method of curing that will prevent any loss of the meat if the rind or skin is removed.

#### Legal Notes

Disclosure and Priority.-- In Hewitt vs. Weintraub (Mercury Vapor Lamps) the Court of Appeals of the District of Colum-bia, in affirming the decision of the Comhis, in affirming the decision of the Com-missioner awarding priority to Weintraub, held that priority was properly awarded to Weintraub on the ground that the inven-tion in issue is not disclosed in certain earlier applications of Hewitt, and said:

"Hence the appellant is here with the concur-ent decisions of the tribunals of the Patest flore against him; and where this appears, as Office against him; and where this appears, as we have frequently said, we are loath to dis-turb such findings, especially where the invo-tion is of a highly technical nature, such as this, unless it is clearly apparent that error has been committed."

Accounting for Profits.—The dethe Supreme Court of the United States in Westinghouse Electric and Manufacturing Company vs. Wagner Electric and Manufacturing Company holds that where the infringer has sold or used a patented article, the plaintiff is entitled to recover all of the profits. Also that where a patent, though using old elements, gives the entire value to combination, the plaintiff is en the combination, the plannin is unusued as recover all the profits; and that where profits are made by the use of an article patented as an entirety, the infringer is liable for all the profits "unless he can show that the profits "unless he can show that -and the burden is on him to show a portion of them is the result of some other thing used by him."

Protecting the Flag.—Representative Cox of Ohio has introduced in the House of Representatives, a bill making the use of the flag or the coat-of-arms of the United States, or any pattern, imitation, or repre-sentation thereof, either by printing there-en or painting thereon or attaching thereto any advertisement or device for the pur-pose of gain or profit, or as a trade-mark or label, or the imitation or representation of the flag or the cost-of-arms of the United States for an advertisement, trade-mark, or label, a misdemeanor. The bill also provides that no copyright shall subsists in the flag or cost-of-arms or other insignate of the United States, or any simulation thereof. The bill size makes it a misdetabulating operations.

The Need of a Stripper for Crimses in the Need of the

A Transfer

The injuries are open to all patestree. The state are inserted by special arrangement in the favorates. Turns in application to the screening Department of the Screening

Pertualizing to Avisation.
FILTION SAGENIES.—6. B. Trockroor. 100
Howard St. Detroit. Mich. This easily conrouled and blamed flying machine is adapted
to foat on water by useas that form a fuld
callon letteres the water and the fourinteraction of the same of the conpart of the same.

WinkLiess Branks FOR CONTROLLING ARROFLANSS.—C. L. VASORBERGE, K. F. D., No. 3, Box 46, Frystreville, Ark. This is reported by the several services of the several several services of the several several services of the several several services of the several several services of the several sev

state it. He also provides as exceptions in dropping bombs or torgedoctions in dropping bombs or torgedoctions respectively. The dropping bombs or torgedoction and the invention of the control of the c

Off. Lasterest to Farmers.
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omical and efficient.

COPTON COUNTRY. R. MANILTON, P. O.
BOZ TIJ, Pennacola, Pla. The matchise covered by this patent employe disk cutters arranged in pairs, the disks of each pair converging toward the front, and in connection with the disks, cultivator shovels are employed at the rear of the machine; the law-ntion resides in a novel construction and arrangement of the parts for raising, lowering and otherwise adjusting the disk cutters and the shorests. There as the comprised is the most several control of the controlling lever.

#### Of General Intere

Of General Interest.

TUBE.—1. W. HAVEN... Il linion Ave.,
Passite, V. W. HAVEN... Il linion Ave.,
Passite, V. W. HAVEN... Il month? some a
paint ribe, mode of its foll or entire material,
for containing paint, tooth paste and other
semi-fuld substances, the tube hole arranged
to open by pressure from the outside to gov
era the outflow of the tube contraint outs a
paints, tooth break, spoon or like article, and
from the inside on release of contraints outs a
paints, tooth break, spoon or like article, and
from the inside on release of contraint pressure.

RACK FOR PAPER BAGS.—C. J. TARE,
BRIENTER, N. Y. This rack in for use in holding paper bags of various sizes and in a manner for convenient removal of bags sizely of
a dastred size as required by the storelesport,
a fast, inclined or vertein prodition or a
counter or either support, and to allow of filiing each individual holder with a bundle of
bags of a size corresponding to the holder.

PROCRES FOR SIRACHIMO OLD PA

bags of a size corresponding to the holder. PHOCESS FOR SIRACHINO GLD PA-PHER, PAPER STOCK, STRAW, ETC.—J. H MERCEREM, MCADEM, N. D. An object of this lavestion is to provide a process by means of which the coloring matter, ink, set, may be removed from old papers so as to make now the provided of printing whiteness. Further to provide a process fee bleaching paper stock in which there are lens saits.

SAME TO SERVICE STATE OF THE S

APPRIANTED INVENTIONS

disinguisis see open to all patestees. The cold is cfree soid in small quantities, and this design with coldre material, such as coal. Coal is cfree soid in small quantities, and this design with coldress of the second of the secon

MBRELLA ATTACHMENT.—T. C. FRED-BRIKERN. Astoria, Ore This invention more particularly comprehends a device designed to be secured on the handle portion whereby the umbrella may be conveniently suspended from



weniently hold a drinking glass and support cigars, cigarectes, ashes, and matches

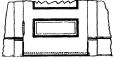
POUNTAIN PRN.—J. J. Mgan, 390 Crescent

RY, Hoodayn, N. Y in this patient the latt.

RY, Hoodayn, N. Y in this patient the latt.

RY, Hoodayn, N. Y in this patient the latt.

RY, Hoodayn, S. Y. Hoodayn, Ry, L. Hoodayn,



DOOR STRUE.

etrip is out of sight, cohperating with mean carried by the door whereby when it is closed the attip with the control of the control of the the attip with the control of the control of the the control of the control of the control of the sagested to lie closely adjacent the floor when the door is closed, even though the floor be irregular or in a different place than that intended Tie comparing shows a partial front rise of a door with the shall prove the showing strip in operative position.

and of the lock, and the width and depth of the cuts for the hinges.

#### Heating and Lighting.

Beating and Lighting.
EIDETRIC (AS LIGHTER) II D GANNILL, Agricultural National Bit Bidg. Pitts
Bold, Mass. This lighter has spark terminals
for convolent and quick attachment to the gas
changes in the tip, at the same time direclax the jump spark across the barner opening
to instite the gas, and to prevent the spark reninnis from being unduly heated by the gas
glam of the number.

#### Household Littlities

COMBINATION NPRING SEAT AND SPRING BACK—G. W ROMETHOD. Mount Verono, Indiana This invention provides a combined apring seat and back, so constructed that the back may move from side to side in the direction of its plane, as well as later silv fin a direction perpendicular to its plane, thereby to conform with the vertical or direct up and down movement of the seat

#### Machines and Mechanical Devices.

Machines and Mechanical Bevices. STRAIGHTENING PIRSR—J. JORSROW 513 Grepp 81, Bethichen, Pa. This invention straightens bars, cranks, and the like, without removing the same from their centres. Further it arranges means for straightening the above which utilizes the leverage action of a cen-al as zero positive pressure caused by the



STRAIGHTENING PRESS FOR BARS, CRANKS ET

action of a screw moving the cam. Means provide for leading bars of any desired length, as to accommodate laws of certain length without removing them from their supporting context, and for accommodating hars of greatelength than the device, by substituting auxiliary supports in place of the cutters. The cugraving shows a fragmentary longstudies accident is well through the structure.

sectional view through the structure

ANIMAL TRAP—W M MAT, cere of W H

Handra, Quitman, Ga This is an easily
cleaned mechanism wherein the entrance open
ing is normally open, and is closed by the entrance of the animal, and wherein other compartments are provided into which the animal may freely pass, but cannot return in
order to permit the trap to automatically set
itself.

Itself.

MACHINE FOR MAKINI STAVER.—T G
MASSIN, 1029 Quincy St., Parkersburg, W. Va
W. Martik's invention is an improvement in stave machines, and has for its object the pro-vision is a machine of this character, of new and improved means for cutting and equalizing staves, while the staves are being moved con-tinuously structured to make the con-tinuously structured to make the con-tinuously structured to machine.

thousely through the machine SHAPT HANGER—G, C SPILLERS, Abx ander Ridg. Tules, Okia. The improvement is in hangers supended from celling piet or bracket; and the special feature is the adaptation of the hanger for adjustment of its more able members for the purpose of piacing a shaft in different position as required to secure alternment or parallellam between different shafts.

FRIEN PAPER STOCK. STRAW. STC.—J. Il adapted to its closely adjacent the floor whose additionant of the control of the control

the column inclusive of the number com-

102

for addition thereto
INTEGRATOR FOR CONVEYER BELT
WEIGHING SCALES W P BICHAS, Box
STO KERNS (IV, MO This investion provides
registering mechanism to display for record
conveyer when operatively conserved with the
mechanism, and provides for recording accumulatively the total weight as the same is
passed over the conveyer to which mechanism
is attached; irrespective of race of travel of
the belt, whereby warfation in the conveyer
mechanism includes to load warfation is the

#### Prime Movers and Their Acces

Prime Movers and Their Accessories.
INERTOR.—W. II. Lores, core of Simma & Enakow, Thompson Pierre Bidg. Hustingtown the Property of the Accessories of the Control of the Control of the Control of the Control of the Accion of said parts and to enake the action of said parts and to enake the injector to be used under greater extremes of temperature of bot and cold water, as well important to bot and cold water, as well within the injector will work provide the control of the Contr

which the injector will work
INSTICE FOR WARPERING INTERNAL COMBURTION INGINESS — D E Cuorae, Annapolis, Mo This device permits the startting of the engine through the action of a
spring under tealors, and the spring in restored to its original position after the engine is
started. The starting of the engine is done
by the movement of a rack into engagement
with a pinion, with means for evizating the
rack out of engagement with the pinion and
threby permitting the pinion to turn freely
with the engine shaft

ANIMATEN TOTA: A GIVEN, Global Mr. Co., 220 W 18th St. New York, N Y. This invention relates to wheeled toys, and its object is to provide an animated toy which simulates as animal, such as a dong, duck or the like, and when drawn over the floor moves certain members and at the same time evints sounds similar to those emitted by the animal simulated

Besigns.

DERHIN FOR A BANK CHECK—P E Hass, 51 Liberty K, New York, N Y One half of the area of this design for a bank check comprises a square of four double rines with suade orannents hody of characters surrounding a center circle insertised with the words Bank Mackey Paper, and in the center of this ring is a U \*\* shirled and eagle

DESIGN FOR A CARRET OR A RUG—G X, Nourse, 4 tulons fequer. New York, N Y is this equilibrity ornamental carpet or rag or etyles of scometrical patterns. The field is flat with a heavy clustering of flowers in the corner, and a measure design for the control of the con

arranged around the plate.

DESIGN FOR A WATER CLOSET BOWL.

J AMIBSON, care of Lambertville Pottery
Co., Lamberville, N J in this simple and
graceful design for a water closet bowl the
distinctly original feature lies in the angular
position of the inlet

DERIGN FOR A LACKET —C DAILEY, care of Kiein & Sons, 14 Park Place, New York, N. Y. In this ornamental design for a locket the little case holds a flat disk on which is pictured an upper half lings of Christ, and on the reverse side that of the full figures of the Madonna and child.

Norm — Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ton cents each Please state the name of the patentee, title of the invention, and date of this paper.

this paper.

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READER'S SERVICE ARDLY a week passes but the Editor receives letters from readers of the Scientific American who ask hom wheher they shall send their boys to a technical school whether a boy shall become amigner, a chemist or a surface and related to questions that pursue parents. The Editor will be pleased to an exact of the Scientific American in deedings the matter of engineer, a chemist or a naval architecture quession na-putate parents. The Editor will be pleased to addread-en of the Scientific American in deeding the matter of technical edication for their sons. Address. EDUCATIONAL BUREAU

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atalogue and illustre os and students and ng canonstorm nd pamphlots showing work of raws of buildings and campus, JOHN J. NUGENT, Registrat

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The work that he is the water tapes of plyine as a prosent and present very. In disorther with tree destruction way. In disorther with tree destruction way. In disorther with tree destruction of the present of a plyine and the second of the present of a plyine and the second of the second of the present of the plant of the plant

MLINN & COyelac., 361 Broadway, New York

VI.-Shall My Boy Become an Industrial Chemist? By Prof. H. C. Peffer, Purdue University.

This is the nirth of a series of articles intended to set forth fairly the business possibilities of the technical professions. The sericles was proposed by men who are connected with the more important technological institutions of the country out who are for the usest pair prominent educators. Because these teachers have instituted hundreds of young men in the principles of engineering, they are been qualified to write upon a subject so immensally important in the future decolopment of American manufacturing industries.—Exerces.

the strictly chemical and metallurgical in-dustries, and he is called upon to take part in numbers of operations closed to him but a lew years ago.

New opportunities lie in the fact that most of our great industrial institutions, in an effort to eliminate waste, improve their processes of production, or to find new outprocesses of production, or to find new out-lets for their products, are founding re-search laboratories, employing numbers of trained men. One such firm has 250 men on its chemical staff; others have smaller numbers, but the significant fact is that a lew years ago such a thing would have

deemed unnecessary. The result will be that the competitors of these firms will in turn be obliged to resort to systematic investigation of their processes, or fall behind in the race, with the further result that skilled chemical technologists will be in noreasing demand.

This field of research is of the greatest

interest to the chemist, because the great-est possibilities for the individual lie in this

direction, and because our industrial devel-opment depends on its intelligent prosecu-It is not to be supposed, however, that the young college or university graduate is fitted to undertake independent investigations; in order to become a succ ful research chemist, the theoretical kno edge gained at college or university must be

supplemented and reinforced by practical experience, and the faculties of observation nd independent thought developed. Neither is research the sole end of a chemical education: our industries are in

need of technically trained executives more intelligent supervision. In these days of large scale operations, increased attention is being given to the purchase of materials under specifications as to compo sition. This may mean, first, the employ-ment of more analytical chemists, but be yond this, it means that primarily the mayond this, it means that primarily the ma-ternal must be manufactured up to a given standard, which marks the passing of the old "rule of thumb" executive, and the advent of one of higher degree of technical training—the Chemical Engineer.

No mention has so far been made of this

newcomer, who will share the field of In-dustrial Chemistry with the chemist, and who is in many respects better equipped than the latter That the importance of the chemist has not been fully appreciated, up to the present time, at least, is no doubt due to the fact that his training has not fitted him to conduct the large-scale on tions necessary in a manufacturing plant to insure the highest degree of success in Industrial Chemistry, it is necessary to be Industrial Chemistry, it is nonemark able to carry through to a practical conclusion in the plant the principles worked out in the laboratory This means, in addition to a thorough grounding in ohemistry. additional training as mechanical and el trical engineer, the combination constitut-ing the Chemical Engineer. The question of the proper college course for this branch of engineering has been under discu for some time, and our attention will b directed rather to a consideration of the important period comprised in the years immediately following graduation, which exercise such a strong influence on a young

The college course in Chemical Enginee ing has of necessity been largely theoretical, and practical experience is necessary to the finishing of the young chemical engin this will come by contact with practical operations throughout the remainder of his

It has not been found possible to crowd the flucture formular possible to crown into the compass of a four years course all the studies which should constitute the equipment of the chemical engineer; he

THE importance of the chemist to modern will be fitted on graduation to enter a Industry is daily becoming more mani-subordinate position in some industrial test, due to recognition of this fact, his plant, and davance step by step, as his sphere has extended beyond the bounds of knowledge of details and practical experienowings of counts and practical energy enor increases. Most men stop here, but in order to make the most of the possibilities open to him, the young chemical angineer should, after a few years of practical experience, spend some time at a good experience, spond some time at a good university in further study. The degree which he obtains may be of little use to him directly, but his practical experience will have given him such a different point of view toward his work, that he should profit more in point of efficiency from his univer-sity than from his collars.

sity than from his college course.

The necessity of starting at the bottom in industrial work is a great advantage; aside from the inevitable readjustment of his ideas as to his importance in the "plan of things," a young man's apprenticeship or trings, a young man a apprenticempy in a subordinate position results in habits of industry and punctuality and a knowl-edge of details which is not to be obtained otherwise. Criticism to which men of unin-terrupted college and university training terrupted college and university training are too often open from the practical stand-point is that they fail to see the advan-tages of starting at the bottom in industrial work. They thus miss the intimate knowledge of details which the practical man possesses, also the advantages of contact with workmen and understanding of them as well as knowledge of what constitutes fair day's work.

It is essential that the chemical engibe able to handle and deal with me on this rock many an otherwise good man has foundered. A term in the works is therefore advisable before completing the nourse of study indicated.

may appear to be quite an ambitious schedule, but, to cite a familiar instance, it is just about what a young graduate in medicine must go through before he is competent to enter upon the practice of his specialty. Great stress is laid on the specialty. proper training for the chemical engineer because, aside from the man himself, it is the thing of greatest importance; the leaders in this field will be those who combine practical ability with high scientific attainments, and other factors being equal, the man with the best preparation will be the most officient.

The general question as to whether a college education is necessary to success along technical lines, is one which is frequently raised, the inference being that it is possible to secure such an education oth than by attending college. Granting for the moment that such may be the case, it should be possible to develop from the larger number of young men in the shope and factories at least as many efficient technical men as the colleges—which is not

The question is not one to be settled by academic discussion; the test is that of academic discussion; the test is that of utility based on the efficiency of the aver-age technical graduate, ac compared with the average non-graduate. Perhaps the most competent to pass on the question are those who come most closely in contact with both classes—the heads and gene-tives of our great industrial enterprise; these men measure in terms of results, and their verdict comes in the shape of demand that applicants for a constantly invessions. that applicants for a constantly increasing list of positions shall be technical graduates. To use another familiar instance, the sales To use another raminar instance, the sales forces of most progressive firms are now largely recruited from the ranks of techni-cal graduates, whereas a few years ago the practical man had the field largely to him-

For the chemist or the chemical e For the enumer or the enumers enumers a college training is a necessity. It may be possible for a bright, determined young man, employed in some line of industry, the acquire by his own efforts a kinthed leaser, adject of the chemistry of that particular

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Maya tenters. With the coming of Cycle

10 the great southern cities rapidly de
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10, whight, is incertibed here on Structure 1

10, whight, is incertibed here on Structure 1

In addition to Structure 1, a low and much smaller mound, some 30 feet southwest of it, was excevated, and this proved to be a building of the dwelling type. (See Fig. 2, where Structure 2 appears in the foreground to the right.)

ears in the foreground to the right.)
This latter building was perhaps of ater interest than its more imposing nd pretentious neighbor on the t behind. To begin with, Structure 2 is older than Structure 1. Indeed, the ter-race upon which the latter stands was milt second Structure 2, covering it up to within 6 or 7 feet of its roof. Only the north side of Structure 2, that containing the doorway, was left open. (See Fig. 2.) The covering up of three sides of this doubtless made for its preservation; and to this fortuitous circumstance alone we are indebted for the solution of several important architectural problems. Until the excavation of this building it had been a disputed point whether the treatment of the façade above the medial cor -L e., the upper half-had been slop ing like a Mansard roof or vertical. Both thods of treatment had been found in other Maya cities, but heretofore no façades, either at Quirigna or Copan, were standing to a sufficient height to deter-mine this important point. In Structure 2, however, enough remained to show that the upper half of the façade sloped back ward. Although this same fact could not be positively established in connection with Structure 1, because of its greater demolition, nevertheless, by analogy, the writer believes that it also may be regarded as having had the upper part of its façade sloping. Probably the same may be said of all other buildings, both

Structure 2 yielded more speciness than Structure 1. A number of pieces of pottary were recovered, including a very fine painted futured vasse with a grotesque human head on one side. Many mother-otpearl beads were found, but long exposure to the moisture had rendered them crumbly and rotten. A few jade beads were also found, but thay were small and in to way worthy of note. The most unique find in Structure 2 was a series of worked hematical." These were beargonal is shape, about one sixteenth of an inot, in thickness and not over one inch is thickness and not over one inch is width between the two potins. One side was very highly polithed in each class, the other heing ground smooth. The edges were beautifully enth; and notice of the fragments showed a bound edge, as though mach, pieces, had formed the border of some accession. The propose four within these wires need in unknown; and so far as the writing is award, synthing little them seems to found.

has ever hees found.

As interesting fineture, conding perhaps
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used for hanging curtains across the doorways, a such needed protection in the
reiny season. In some cases another pair
response to the food leval, so that the
hanging could be secured both at top and
bottom from Sapping in the wind. These
hooks always had their points upward, so
that hope could be easily placed over
them. Nothing of this kind was found in
Rructure 1. The false arch, by which alf
Maya structures are roofed, was standlag to the height of the capstone in this
building. This type of roofing is made by
projecting the courses of two opposite
walls slightly beyond the courses next
below them in each case, and continuing
this operation until the walls have been
drawn close enough together to be bridged
with a capstone. From this building it
was thus possible to ascertain the approximate beight of the rooms here at
Quirfgua, i. e., about nine or ten feet.

The quarries from which the building to

The quarries from which the building stone was obtained are some two and a half miles west of the city. The material in Structure 1 is a sandstone of rather fine grain, while that in Structure 2 is a volenate rock, much harder and stronger. Both were worked with stone chiesies, besait being the commonest material. Several such chiesies were found during the course of the executations. They varied from 4 to 6 inches in length, had byt one cutting edge, and were shaped to fff the hollow of the hand. There was no indication that they had ever been supplied with any form of handle.

In addition to the specimene collected, the most important results of the season's work were (1) the discovery of the new hieroglyphic texts and the exceedingsy important data which they present, (2) the discovery that the upper half of the façade in Structure 2 was sloping rather than vertical, (3) the discovery that all sculptured stones were originally covered with a coating of white lime plaster varying from a very thin slip to one half inch in thickness, and (4) the discovery that AS Structure 2 was of greater antiquity than Structure 2.

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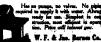
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MANNERIES AND M CLITTLESK SLIDE RULES.

MANNHEIM AND MULTIPLEX SLIDE RULES.

By L. W. Rosenthal. New York The
Eugene Dietzgen Company, 1911. 16mo.;
67 pp. Price, 50 cents.

87 pp. Price, 50 cents.
The silds rule is of such universal application, and is as simple to operate, once the principles are well understood, that it is extraordinary that the visual network of the price of the p

ELEMENTARY GRAPHIC STATICS. By W. J. Crawford, D.Sc. Philadelphia. J. B. Lippincott Company, 1911. 12mo.; 131 pp.; illustrated. Price, \$1.

pp): illustrated. Froc. \$1.

A short time ago we took occusion to mention favorably a textbook by Catheart and Chaffee entitled "The Hemmest of Graphic Resides." This has been condessed and, with the nature mainly forces and equilibrium, polygome, appears as "A Short Course in Graphic Station." The "Elementary Graphic Raties" of W. J. Crewford pressure another short course. Both are good, but while subject, the latter starts with simple definitions, construct simple appearatus, includes review questions, and will probably prove the more streamly and the shoulder type.

CONCEALINI-OLORATION IN THE ANIMAL KINGDOM. An Exposition of the Laws of Disquise through Color and Pattern. Being a Summary of Abbott H. Thayer's Discoveries. By Gerald H. Thayer's New York: The Macmillan Company, 4to, 260 pp.; 16 colored plates and 57 black-and-white plates. Price, 87 net.

410. 200 pp. 16 colored plates and 37 black-and-white plates. Price, \$7 net. It is tritting that a book setting forth the observations and deductions of an actal should be a magnificent specimen to the typographe's art, and the strength of the author defines concealing-coloration as simply that which enables the wearer to be mistaken for events details of the seven, and the discovery—or theory, if you prefer the—is that almost the coloration of the section of the seven and the strength of the section of the seven and the section of the section of the instaural labilitation. No matter how conspicuous an object he may be when removed from his own domain, while there his coatuming is that best fitted to melt into its approaching third, beaste, finite, repilies, and in case of the volume is far remarkable illustration, in which blick, beaste, finite, repilies, and insect are shown with scientific and artistic accuracy becausit he light, and with the background. It cortainly represents a was amount of sympathetism of their markings has free play. We understand the volume was eight years in preparation. It certainly represents a was amount of sympathetic and irrefulingly of the play. We understand the volume was eight years in preparation. It certainly represents a was amount of sympathetic and irrefulingly of the play.

ELIZABETHAN INTERIORS. By C. J. Charles, London: George Newnes, Ltd. New York: F. Greenfield, 1911. Folio. 40 pp. Numerous plates.

40 pp. Numerous plakes.

This super- book is printed from original plates, exchings, and drawings; and the selection of them is most admirable and the plates beautifully reporduced. It is, in fact, a book which will be welcome to the libraries of all architects and consolicaturs. The text, which is beautifully set in very layer type, is printed on headmade paper, the in-pression being such into it to match the plate bound is moreoned and bonder. The surface of the Blassbelhan style and the adaptability to more presentation homes is well brequiet out. The set amples shore include smany interfere in this country. The Bays delition consists of 300 copies. It is one of the mass admirative architectural books that we hack in the deviate when the content of the set of the mass of the set of the set



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More automoting than ever are the achievements of the modern chemistra-more automating than ever Pasters dreamed. Who could have thought that rubbe—risel rubbe—could be made out of turpersine, out of potateos, out of coal tize—there wodey different substance. Who would have thought, twenty years ago, that ugas, seet, flour, almost every article of necessary, would in this year insistent hundred and twelve be made not by hapshazar rules of thunds in a factory, but by tasked chemists, armed with instruments of precision, with nest tubes, and retors? Who would have thought that even the honored art of cooking would be reduced to a chemical basis and that the latches would become a find of laboratory? That the booking of a stack of even the north procedure, and a matter of chemical the booking of a stack of even the north procedure, and a matter of chemical to the stack of even the north procedure, and any would become a matter of chemical to the booking of a stack of even the north procedure, and any would become a matter of chemical to the stack of even the north procedure, and any would be come a matter of chemical to the booking of a stack of even the north procedure, and any would be come a matter of chemical to the procedure of the procedure

The next mid-month number of the Scientific American which will bear the date August 17, will present some of these marvels. Only the business side of the chemis's activity will be dwelt upon; for here in the last few years amazing results have been achieved.

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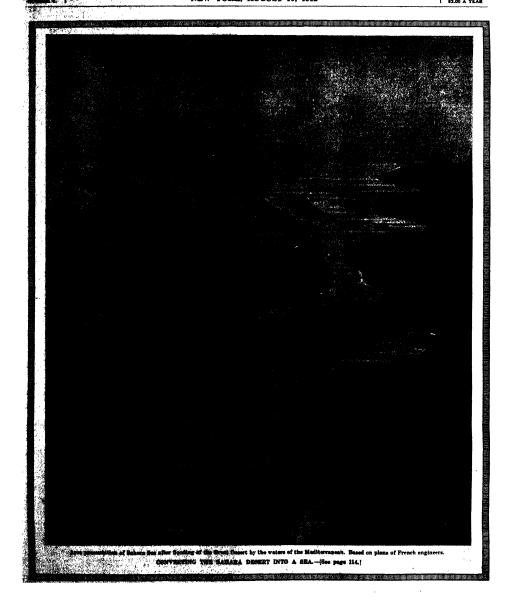
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THE WEEKLY JOURNAL OF PRACTICAL INFORMAT

NEW YORK, AUGUST 10, 1912

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# SCIENTIFIC AMERICAN

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Munn & Co., Inc., 361 Broadway, New York The Pdit a is as giad to receive for examination illustrated and the second of the property of the transfer of the second of the

The purpose of this journal is to record accu-itely, simply, and interestingly, the world's rogress in scientific knowledge and industrial

Board of Trade Report on the "Titanic" of the readers of the Scientisic American the most interesting portion of Lord Mersey's report on the loss of the Titanic will be those sec tions in which he makes recommendations as to the eitments of sufety which should be incorporated in the construction of future passenger steamers. From the very first this journal has held that the most serious feature of the loss of this vessel was the fact that she armore or the sort of this viewer was the incit that she with to the bottom so soon after the collision and we have shown that her failure to remain aftout until the receing vessels could truch her was due to the omission from the ship of certain protective features in the way of more complete sub-division which had been present would probably have prevented the loss of a single life

Tord Mersey attributes the loss of this ship pr arily to high speed and an insufficient lookout. He sould have been closer to the facts if he had stated that the collision was due to these causes and the loss of the ship to het insufficient sub-division below the water line By implication if not by direct arraign the report must be taken as a scathing indict ment of the provisions of the Board of Trade an ment of the provisions of the Board of Trade, and the public may read assured that these recommendations following holing very much the same lines as those to be found in the report of the Senats is investigating. Committee will lead to some very thoroughgoing is forms in the Board of Trade it is naturally scrittlying to the Neikripia Assurant to note that the recom-mendations of a stuterinal character made by I ord Mersey are identical in character and number with those which were suggested by this journal in its first analysis of this disaster made within a few days of its

It is recommended that the Board investigate the practicability of providing sea going ships in addition to their watertight transverse bulkheads with a dcuble skin carried above the waterline n with a longitudinal vertical watertight bulkhead of side of the vessel in with both. The Board is in structed to investigate the question of providing a watertight dock or decks, stretching along the whole watertight dock or docks, stretching along the whole or part of the length of the ship at a convenient dis-tance above the water line and it is to determine whether the epenings should be watertight doors or some their device.

It is further recommended that the subdivision of the vessels in the communion in the sourcesson of the vessels in the isomorphism as to keep the ship afford with the printest proportion of her length in communication with the sear. This of course refers to the present [r vision which contemplates only two adjoining compartments being open to the sca. Phis provision should certainly cover three or even four commitments

most important recommendation is that the B ard of Irade be empowered to enforce their conclusions on the foregoing points and to require that the designs of ships should be submitted to it in the early stages of their construction

have frequently pointed out that ships which embodied these constructive features would be prac-ticully unsinkable—that at least they would remain affoat long enough for rescaing vessels to transfer the To this extent they would serve as their pussespect to this extent they would serve as their own lifeboats. Nevertheless in view of the fact that the majority of ships are not built along the lines suggested in this report we are glad to note that I ord Mersey recommends that the lifeboat accommodations on see going vessels be based on the number of persons carried instead of on the tomage of the ship, and that

carried instead of un the teamage of the ship, and that they be sufficient for all of board Important also is the resommendation that an inter-national conference be called to agree on a common rule for the sub-division of ships, also as to life-saving apparatus, wireless regulations, speed in the ice regions and the use of searchights.

### A Bureau of Farm Power

HAT highly efficient department of the Federal Government which is devoted particularly to the Interests of the farmer, contains among its subns a bureau for the investigation of soils, a bu reau of chemistry for the analysis of fertifiser a bu teau of plant industry to study the bacteriological problems connected with plant production and plant nutrition a bureau of entomology to obtain and determinate information regarding injurious insects affecting field crops fruits etc a bureau of biological survey which measures for the preservation of heneficial and the destruction of injurious species of birds and and the destruction of injurious species of using an immunals a bureau of animal industry for the inspection of animals meats and meet food products, and the investigation of dangerous diseases among live stock, and a weather bureau which will keep the farmer in formed as to meteorological conditions. It would seem with all these different bureaus the interests of However there the farmer were well taken care of is one important branch of farming that has been entirely ignored by the Department of Agriculture, namely the subject of farm power. The American farmer has outgrown the age of hand labor and animal labor is now on the wane. Steam power was introduced on the farm many years ago and of late the internal combustion engine has been playing a very important part and now electricity is beginning to be

The epoch of mechanical power on the farm has begun, and it is important that farmers be clucated upon matter pertaining to labor saving machinery. Realizing this need Mr. H. T. Rainey of New York city introduced a bill in the House of Representatives last month to establish in the Department of Agriculture a Bureau of larm Power The province and duties of the bureau are to investigate and report upon all matters pertaining to methods of furnishing power on farms and all labor saving machinery adapted for use on farms and the use of electricity gasoline and steam in propelling farm vehicles in operating plows renpers mowing machines threshing muchines and other machines and implements used in planting cultivating harvesting and marketing corn wheat outpotatoes has rice, vegetables and all other agricul tural products

shall be within the province of said bureau to make diligent investigations into the matter of ma chines and labor saving devices used in the dairying industry as conducted on farms and into the methods of heating and lighting all farm buildings in general, said bureau is authorized and directed to inve diligently all muchinery and devices which will lessen timeenty an interior and devices which will be seen the amount of labor necessary in agricultural pursuits and lessen the expense of producing and marketing such of the necessaries of life as are produced on farms and to report the results of said investigations to said Department of Agriculture

e hope that Congress will see fit to establish this much needed bureau.

### A Question of International Good Faith

RTICLII 3 The I nited States adopts as the bash of the neutralization of such ship cannot the following rules, substantially as embodied in the Convention of Constantinopic signed HTICLE 3 The I nited States adopts as embodied in the Convention of Constantinopie sig-the 28th of October 1888 for the free navigation the Sucz Canal, that is to say 1 The canal si-be free and open to the vessels of commerce and of of all nations observing these rules, on terms of si-1 The canal shall equality so that there shall be no discrimination against any such nation, or its citizens or subjects in respect of the conditions or charges of traffic or otherwise'

The above quotation is from a treaty concluded in 1901 between the United States and Great Britain, Hay-Pauncefote Treaty stons made by Great consideration of certain concess Britain the United States agreed, among other things, to operate the canal under similar conditions as regards e ships of all nations making use of the canal. There is now before Congress a bill which pro-

to remit the tolls on ships flying the flag of this

It does not take a legally-trained mind to see that such exemption would be a distinct breach of fatige on the part of our flavergraphets. The question is one simple, every-day mostality. Questions of more likely are universal in their application, and the code

of henor is an atree in the Government like our was at a citizen is it not indeed irreach of faith on the part of himself sill, whereas it begins in of the binety-five millions of h

the fast The peril of the present artifaction as a line fast The peril of the present artifaction as a line good faith lies in the fact that the fact that the clouded by sophistry Specimes calcinomias and leading phrescology may easily divert the white a busy people from the real points at land in a we not make the other people pay for it? "The till
Nintee has invested nearly \$400,000,000 in this ma
prise, and why should we becamed apon to pay the
ships the same rate of tollow we charge the ships of the ships the same rate of roll as conarge case many or, or mattons, the have contributed unt a slauge deline to the great work? The nawer to all this is, that, our Government, after a careful review of the whole stop too, and in view of the collareral advantages to be secured in the way of the abrogation of previous existing treaties affecting the influence, and the place of Great Britain that the Canadian and the Canada shall be operated on terms of equality. enter into a solemn agreement to operate the Panassi Canal upon terms of equality; and if the United States Government should now violate that treaty by operate ing the canal upon terms of inequality, it will stand condemned in the eyes of the whole world as having

committed an act of international distancer
Furthermore, the exemption of United States ships
from the payment of tolls would be to divert a portion of the reasonable profits of the canal into the pockets of certain private corporations. We cannot shut out eyes certain private corporations we cannot and our eyes to this fact. The remission of these tolks will not mean the return of any profits of operation back to the National Tressury and no amount of argument can possibly show that it will it is urged, of course that the remission of tolls will serve as a powerful stimulus to the upbuilding of our merchant marine. But we are not by any means prepared to admit that it would What we do claim however, is that whatever sollateral benefits might be secured, it is impossible to overlook the fact that the gain would be made at the cost of our national reputation for honor and square d

The SCIENTIFIC AMERICAN, as our readers well know, an earnest advocate of the upbuilding of our ship plug industry, but upon mature consideration we feel that this expedient of remitting Passems tolks is not, and in the nature of things, never can be, the legiti ate way to achieve this object.

The construction of the Panama Canal must rank

at the greatest achievement of a physical character that has ever been undertaken and successfully put through by the United States. We have gained an enviable reputation therein, and in this particular field. our prestige as a great engineering people has been immeasurably increased. It would be a lamentable commencement of the operation of the canal if we were to cloud this great project by following a course which would bring down the condemnation of the whole civilized world

### "Making" Rain in Battle Creek

N July 254 Battle Creek, Minh., 'put itself on the map' to quote a local paper; by belding an exhibition of the alleged efficacy of dynamite in producing rain. If the purpose of the exhibition was to attract a large and interactive influe of visitors for the benefit of the community in general, or to advect the wares of a local manufacturer who financed the case the wares of a cook manuscotter was managed the enterprise, or, finally, to promote the sale of explosives, then the citizens of the Muchigan town are to be con-gratulated upon the results of their efforts. Mention should also be made of the moving-poters men, who were present in force to make the most of an unnearis event. about also be made of the moving-noture men, who were present in force to make the most of an emmand et each. About 4.000 paguads of dynamities were exploded in the ourse of the substances of

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Constitute of Canal so be Drug.—On July 1st, the past third of canal steep value, was 178,269,815 cubic years, the two past the secondary of 2,063,864 cubic yards. This means that more than one-eighth of the entire ambusis necessary for the completed canal remains to

be encouraged.

Maching Newer Seals Gatem Lake.—Electric power will be mad discord confidency for operating the Panama consid. The Apron-descries testion will be steasted adjacent to the new wall of Gatem spillway and the installation will have a capacity of 6,000 kilowater. The averagin hydractic head throughout the year will be about 75 spills. The maximum quantity of water diverted for hydra-descrie development will be approximately? per desired the statement of the statement was seen to the statement of the statement was seen to the statement of the statement was seen to be access which is not required for lookages, evaporation, and leak-

Constituent Pavers Life Pentsona.—The pontoon method of saving life in the event of the foundaring of a skip, as illustrated recently in the Scursvirzo Carantana, finds as: illustrated recently in the Scursvirzo Carantana, finds as: illustrator of the local navy. He believes that the upper sall after pertion of a skip, containing the molane, see, should be constructed of wood and form a structure independent of the rest of the skip. This should be botted to the built by fastenings which could be readily unlocked in the event of the loss of the skip. Find T. Jane, who mentions the fact in the Now, suggests that the idea is not any more far-fetched than the idea of building dreadnoughts when it was first suggested by Cuniforti.

Lexington Avenue Sahway, New Yerk.—The largest work of subway onstruction now being carrill on in the world is that being done below Lexington Avenue in this world is that being done below Lexington Avenue in this centire length, is about 10 miles long. Eight of the 10 miles are now under settive onestreation, and the total cost of the work on this S miles alone will be over \$35, 500,000.

Work is also being prosecuted on the four-mile, four-treak subway on Fourth Avenue, Brooklyn, and the Center Street loop subway is being completed. Altogether on the three systems there is no we under contract about \$81,000,000 worth of work, covering 13½ miles of four-tender works.

A Fwirty-lenel Hydroplane.—England is again about to make an effort to recapture the Harnaworth out for motor boats, which is now had in America. Four boats have been built, and of these the fastest is the "Maple Leaf" over a 34-not course, maintained the remarkable speed of over 40.08 knots or about 46 miles an bour. Considering the length of the course this is certainly an extraordinary speed; and in view of the fact that several boats have been built in this country which are credited with equally high speed (that is to say, if the newspaper reports are correct), we may look for an excellent contest this summer on Long Island Sound.

som summer on Long Island SOURG.

Reduce Rallyav Speed.—The Publis Service Commission found that the breaking of the rail which caused the wreak of the Treatient Contury Limited was largely due to the high speed of the train, and it referred to the sobolius as being 'too feat for arising of rails could be prevented by putting more metal into the base. Both points of view are correct; but we are inclined to agree with the Publis Service Commission that, as mattern now stand, and in view of the heavy wheel loads, the rail is not equal to its task. If rails were beavy, and if the specifications were stricter and the process of manufacture were carried out with greater care, railroads could run their trains as fast and even faster than they do to-day, with impunity. It is quite possible to manufacture rails which will stand up under any traffic whatcover; but it is certain that the average rail used to-day on American railroads is not equal to tick utiles.

na neutronia is not equal to its duties.

Desible-deck Chief for New York.—It is reported that the Interborough Conspisus, is studying the question of the introduction of double-deck cars in New York city. This is the right idea; indeed, its Scientruc Amancar, many yeste age, had as series of articles strongly advocating the use of this type. The introduction of an upper delifyproximity doubles the capacity of the cap without invelving any propositions increase in the weight or in the parture necessary to drive it. The number of passages are also and when this public girls activitioned to this type, we believe that there will be very little increased delay at the stopping iffests, due to the larger number of people boarding or linguish ones. The low one which it running experimentally in New York which he well adapted for decible decible, as also text height of month a car with also the continuous desires which as the continuous decible conduction as the text height of month on any with also the continuous desires which the proposition deniate would not be so great as to interfere with the proposition deniate conduction, as also text height of many of the occasings for members of the continuous desires which the proposition deniate which the proposition deniates and the continuous desires and the

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### Science

bit. Meximiey.—A telegram has been received from Mrs. George Brown, mother of Belmore Brown, the companion of Prof. Herschell Parker on his third attempt to accend Mt. McKinley. The telegram states that a height of twenty thousand feet was reached, which means that the summit is still unconquered.

Plans of Capt. Ammdesn.—The discoverer of the South Pole expects to return to Europe in September and will make a settee of addresses before the principal geographical societies, beginning with the Norwegian Georaphical Society in Christiania. He is to address the Royal Geographical Society in London on November 18th. The Norwegian Storthing (parliament) has voted him a grant of 136,365 kroner (about 356,818) toward his prospective north polar expediction.

The Cast of Discovering America.—The English newspapers print a report from Madrid to the effect that some ledgers discovered at Palos, Spain, contain interesting information on the cost of discovering America by Columbus. The sum total for which America was descovered amounted to \$7,000, or 38,000 peetas. This was distributed as follows: 14,000 peetas for armanent; 2,000 peetas for personal expenses of Columbus and his officers add erew; 22,000 for general expenses during the eight months for which the voyage lasted. The sum of \$7,000 in 1492 represented \$70,000 in 1912.

Mitheleen Heard From.—A most amazing tale of hardship endured in the polar regions is that of Capt. Mikiesisen published in the New York Times. He suffered from the very beginning. Abyases, storms, lack of food, serury, all imaginable obstacles to polar exploration he encountered. Only the brifest details have been received outside of the news of the safe return of the men. Capt. Mikiesisea and his companions resolved Denmark Firth on May 20th, 1910. There they found the records left by Eciclesen. They began their return journey nine days later and encountered terrible hardships. They reached Shannon Island. They had a bandoned all hope of their resour when they were picked up by a Norwegian fishing vessel on July 17th last and brought back to

The Alaskan Reindeer Herds.—During the ten years, 1880-1902. the U. S. Bureau of Education introduced 1,290 European reindeer into Alaska, where the natives were threatened with starvation owing to the destruction of the once abundant American reindeer, or earlies It was also expected that these animals would serve the many useful purposes in the domestic conomy of the Alaskans for which they have been no highly prized in northern Europe and Asia. The success of the undertaking has been remarkable. A recent official report on the subject states that these herds, which are under the care of the teachers at the government schools, now number 33,629 head, and they are increasing rapidly. Their meat is in great demand by both whites and natives, and their akins supply the best winter elothing. It is expected that the exportation of reindeer neat will soon become an important industry. Above all, the rundser has proved a most efficient civilizing agency. The success of the Alaskan reindeer enterprise induced Dr. Wilfred Grenfell, in 1908, to import 300 reindeer from Lapiand into Labrador, where they have now increased to about 1,200, and are a great boon to the natives. Last year the Canadian government bought 50 of Dr. Grenfell's herd for introduction into northern Canada.

Observation of Solar and Lunar Halos in France.—
The most complete descriptive account of all known forms of solar and lunar halos is that published last year by Louis Beason in L'Astronomica, the organ of the Astronomical Society of France. The principal purpose of M. Besson's memoir was to call attention to the urgent need of socurate and systematic observations of these interesting phenomena, many of which have no rarely been seen and described by trained observars that the data needed for their theoretical discussion are decidedly fragmentary as present. This suggestion has met with a hearty response on the part of French metocologists and sattomomens, and every number of L'Astronomic now constitute reporter and descriptions of halos; often accompanied by differings, and sometimes by photographs. Several rast' dribt have a tracely been reported. In only one other estimate, we have been published annually by the Metocrological Institute of the Niedlindends and have greatly carched the branch of seientifications and several rast's dribt have a large and active orbiffor halo observing the world over has been remarked fifting with this generally neglected subject. The histilizer's halo-observing the world over has been remarked fifting with this generally neglected subject. The histilizer's phenomens were much more generally watched for and more widely known to scientific men than they are stoday. A revival in the study of halos is an usgint deadlessatum, especially common in the polar regions it is destrable that polar explorers should acquaint themselves with the deathed interature of the subject (all of which is in French and German) before they embark upon the first than the subject (all of which is in French and German) before they embark upon the subject (all of which is in French and German) before they embark upon the subject (all of which is in French and German) before they embark upon the subject (all of which is in French and German) before they embark upon the subject (all of which is in French and

### Aeronautics

The Military Breguet Biplane.—The new military biplane designed by Breguet is a remarkable mechine in every way. The power plant is mounted in front as in most monoplanes A 14-cylinder 100 horse-power Gomen engine drives ten two-hiladed projecties through reducing gear. Only four very stout vertical struts are employed between the planes. The body is of torpedo shape and is constructed of steel tubing, steel girders and ash. Wood plays but very little part in the construction of the machine. The machine can be completely folded in five minutes.

The National Balloon Content.—On July 28th even balloons row from Kannes City, Mo., in the National Elimination Race. The winner was the balloon "Uncle Sam," piloted by Capt. H. D. Homeywell, Ray F. Donaldson, and, entered by the Kannes City Aero Cub. The distance covered was about 1957 miles, the balloon landing on the historic battle ground of Bull Run. The second in the race was the "Kannes City H.," piloted by John Watts, George Quisemberry, and, entered by the Indianapolis Aero Cub. The distance covered was about 540 miles. The third in the race was the balloon Dirftser," piloted by Albert Boltz, Charles Pratutman, aid, entered by the Chemmati Aero Cub. The distance covered was about 425 miles.

Requirements for Naval Aeroplanes.-On the 25th nequirements for Navai Aeropianes.—On the 25th ut specifications for hydro-aeropianes, with which, hy another year, it is hoped to have every battleship equipped, were issued. Constructors are requested to inform the Navy Department by August 15th it they intend building machines to fulfill the requirements, and to state when such machines will be ready required to carry, as a full load, two persons of a combined weight of 359 pounds, together with a wireless outfit and other instruments and supplies for a 4-hour flight. A maximum speed of 55 miles per hour must shown as an average of ten flights—five with the wind and five against it over a mile course, and 50 miles per hour throughout the 4-hour endurance test with full load. The latter test will be made over a 5-mile triangular course, the speed being determined by a recording anemometer. All machines must rise from the water in still air, with a run of not over 1,000 feet; must climb to 1,500 feet in one or more big spirals and in a given time (not yet determined) must turn without skidding, stalling or sliding, in a circle of 200 yards radius, and must glide from a height of 500 feet with radius, and must gine from a neight of the free ways in power off a distance of 2,500 feet in a horizontal dir M tion. Air-cooled motors are preferred and an extra-se premium will probably be offered for a heavy-oil motor one using kerosene or alcohol. It must be arranged to be started from the seat by the pilot. The machines must be able to be hoisted on board ship intact and to be quickly disassembled. The hydroplane floats must watertight compartments and means of draining y. The aeroplane must be able to remain upright readily. on the surface of the sea in a 20-mile wind when the motor is stopped.

Woman's Opinion of Aviation.-Mrs. Elizabeth Hiatt Gregory, a woman writer who specializes on aeronautics, gave a beture before the Aeronautical Society of New York on "Woman's Part in Aviation" It was the New York on "woman's rart in Aviation" It was the opinion of Mrs. Gregory that flying is an unsuitable eccupation for women, and under no circumstances should she be allowed to use an aeroplane, since its safety is mostly a matter of gamble. Instead of relying upon an instrument, the aviator trusts principally to his own watchfulness, which obviously leaves the margin of danger very great, as there are many accidents due to uncon-trollable error on the part of the machine or tricks of the wind. Mrs. Gregory stated that aviators put too much ss on their ability to ward off accidents by this watchfulness As an example she referred to the late Miss Harriet Quimby, whose very first accident resulted in her death. "A few days before her death," said Mrs. Gregory, "Miss Quimby told me that driving an aeroplane was a safe as riding in an automobile, as long as one was careful. She had tried both—She thought mis-haps with few exceptions came to those who attempted rdy feats. She claimed that in driving an auto mobile the driver has sudden starts and stops, twists and turns through the crowded thoroughfares; while the ar-pilot must constantly be on the lookout for cross-currents and pockets that may upset his craft." Miss Quimby thought women were as well fitted for handling an aero-plane as men. It was merely a matter of personality, she maintained. The lecture was illustrated with lan tern slides, showing both the American and foreign women of the air Pictures of men fliers in spectacular feats were also thrown on the screen Mrs. Gregory said that while only twelve women in the world have been licenses, there have been five deaths Three of these have been American women. The first was Miss Demse Moore, an American gul, who while completing her tests for a license at the Farman School ornapseums ner teste for a necesse at the rarian sensor in Paris, had her fatal fall. The other two were Miss Harriet Quimby and Mrs. Julia Clark. Both Miss Quimby and Mrs. Clark had made their qualifying tests.

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# The Cream Separator

# Its Development, Advantages and Unsolved Problems



bowl fastening shell, liner and

HIFTEEN years ago the cream I eries of this country still fol-lowed the custom of maintain-ing cream routes, from which the hand-skimmed cream was collect-ed from three to six times a week. A few years later these routes were a thing of the past Instead, separator stations were maintained at centrally located points, to which the farmer could bring his milk, have it separated in a few minutes, and return with his skim milk and recept for his cream. But now another change has come over the industry, and instead of taking his to one of the numerous separator stations, each farmer separates his milk on his own farm and in his own separator, and once or twice a week, when he goes to town to deliver eggs and to buy provisions, he takes along the cream The one great factor in these revolutionary

the contribugal separator, and it is the purpose here to trace very briefly the growth and development of the separator, to point out its advantages, and to discuss some of the problems still unsolved

Your milk, homogeneous when bottled at the dairy, will be found in two fairly well defined layers when you bring it in from the doorstep early in the morning. A few hours later, the line of separation will be found at a lower level. The separation is due not to one cause, but to several, but the most important single cause, and the one which determines the relative posi-

tions of the layers, is the fact that the particles of the lower watery layer are heavier, or rather have greater mass. than the particles of the upper or olly

r. The older methods of separaon all depended on the force of gravity acting to separate the two comprovements were directed to modifying other conditions. It is a well own fact that the relative viscosity of the two constituents influences the rapidity of separation, and the relativ viscosity can readily be modified through certain changes in temperature. Both the shallow pan method and the deep can method depended for

their efficiency on a favorable adjustment of viscosi-ties. The water dilution method was only another step in the same direction, but although all of these methods were in use for many centuries, no appreciable advance was made in the industry

The mass of a body cannot be changed. or apparent mass, can however be changed by putting the body in motion. A very simple experiment will prove this if a rapidly descending elevator comes to an abrupt stop, the sensations of the passenger will be convincing A small weight on a spring balance sus-

pended in the elevator would give the exact measure of this apparent increase in mass. The spring balance may also be used in another way to demonstrate the same truth. Secure a weight to the balance, and swing it at arm's length as you would a sling. While in motion, the plouter indicates a greater mass than when at rest. The mass remains the same, but apparently it increases, and in this case, the force which produces this result is known as centrifugal force. This force is similar in effect to that of the force of gravity, within wide limits it can be incres

A liquid composed of two liquids of different densi-ties, as an emulsion of oil and water, remains stable only by virtue of the attraction of the particles for one another, which varies with the different liquids. In the case of oil and water, this attraction is very small, and to break up such an emulsion it is necessa only to apply a force which will overcome the attra tion between the particles of oil and the particles of water. Gravity alone will do it by acting more power-fully on the water than on the oil. If the force of gravity would be multiplied say by ten, then the weights would be multiplied by ten and the difference between the weights would be correspondingly increased. This would mean that while the force which tends to hold the particles together remains the same, the force which to pull them apart is increased ten fold. The result would be a more rapid and a more thorough separation. The force of gravity, however, cannot be increased, but in the centrifugal machine we have a force which will accomplish the same result.

Throughout its development, the history of the cream separator is inextricably bound up with progress in a number of other arts. The high speeds necessary for efficiency were made possible only by many improvements in journal boxes and frictionless bearings. Then, too, the development of the separator had to wait on the development of steel--nn extremely hard steel for





the bearings and an extremely tough steel for the bowl. It must be remembered that the pressure generated within that thin wall of steel is as great if not greater than the pressure in a locomotive bolier. But we shall confine ourselves here to the development of the centrif-

ugal machine for separating out the cream from milk. The first application was made about 1860, in Germany, with a glass tube swung rapidly about a center, to determine the richness of milk samples. The modern Balkock tester is identical in principle. It consists of a vertical spindle with radial horizontal arms on which

graduated glass tubes containing milk samples are suspended. By rotating the spindle through its gear-ing, the tubes as-sume a horisontal position. The first attempts at separating cream from milk in larger quantities were made with a simi lar apparatus, pails being used instead of glass tubes. n followed the single closed pail, centered in an upright position on a vertical spindle. The rapid rotation caused the milk to



Sectional view, showing course of the milk entering a bowl and the paths of the skim milk and cream during and

assume the form of a wall at the periphery of the pail, assume the arm of a wan at the periphery of the pair, and when the machine was stopped, the two layers which had been vertical became horizontal, with the cream on top. All of these devices necessitated hand skinning after separation of the infilk into layers. Such was the state of the art after twenty years of develop ment, when in 1880 Houston and Thompson obtained a patent on a self-skimming separator which was continuous in operation. This machine was faulty in practice, but it marked an epoch in cream separator history because it pointed the way to other inventors, who quickly solved the mechanical problems involved in the working out of a successful separator of this type.

The next great step was the invention of the liner,

1890. This consists of a number of division contrivances in the bowl, dividing the milk into thin layers, and intersecting the radial path of the milk in its passage toward the periphery. Separators up to that time had all been of the hollow type. In nearly all, the milk was fed in through a central tube to the bottom of the bowl and the skimming was done at or near the top. The milk thus was caused to flow outwardly from the center and upwardly along the wall. The liner, however, broke up the milk into thin layers while unr the influence of centrifugal force.

and thus avoided the eddy currents which would tend to form in a hollow bowl. Before von Bechtolsheim's in-vention various division contrivances were already in use, but none of these were based on the liner principle. Baffle plates were well known. Their function was name plates were well known. Tank function was merely to compel the body of milk to partake of the motion of the bowl, since its inertia would otherwise cause it to travel at a slower speed. Thin horisontal plates, to obstruct the milk in its unward path, had also been in use. Dr. Gestaff de Laval. (Continued un page #4.)



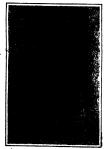
ure in position on the spindle. The milk is fed through the hollow spindle I emerges between the disks, through enings in the wings W.



Tool for holding together the disks of a liner while washing them By the use of the tool the disks may be washed as a single piece.

m; blac





especity of four hundred and e pounds of milk per hour. The measures forty-six and a laif isight to the top of the can.





# The International Motor Contest at Winnipeg

An Annual Traction Engine Contest that Means Much to Farmers and Manufacturers

By L. W. Ellis



A Case steamer taking water on the run.



L. H. C. Mogul 45, pulling eight plows in class B, and winning a bronze medal.



The line-up before the start.

The American gas tractor in the foreground: the Runnely 15 horse-power oil tractor at the left; and the international Mogul in the distance.



Driving a bee-line with a 15 horse-power Rumely tractor.



The J. L. Case gold model winner in class B. Drawing five plows.



victory over the Sawyer-Massey Company in the class for the largest ournes. The latter company was unfortunate enough to meet with a minor accident shortly after the start in the ploving test, and it was necessary to draw fires until a new blow-off cock could be put in place. The Case-Company was awarded the gold medal and two diplomas.

None of the other large steam engine concerns such as Reeves, Avery, Rumely, Nichola & Shopard, or The Russell & Co., entered the steam engine classes, although competing strongly in the market. There is a tendency to belittle the steam engine trade of the present because of the overshadowing number of internal-combustion tractors brought forth in those competitions. However, steam tractor firms are all apparently building as many engines as before, and some have greatly increased their business, even in the face of the strong gas tractor competition of the last few years.

The International Harvester Company, the Avery Company and M. Rumely Company have been consistent performers in these competitions for a number of years. This year the International engines won a gold medal in the smaller kerosene class; a silver medal in the starter gazolim class, and a bronze medal in the larger gazolim class; and a bronze medal in the larger gazolim class; and a bronze medal in the larger kerosene class, having had five entres in competition. The tractor, made by M. Rumely Company, won easily in the larger kerosene class and scored the highest number of points given to any tractor in the entire contest. The smaller Rumely tractor, with a motor somewhat different in design from the standard type, secured a silver medal in its class, though scored low on fuel consumption. The Avery Company secured two bronze medals, one on korosene and one on gasoline, using the same type of engine in both cases.

safes type of engine in Both casses. Canada, was not well represented in the context although Goold, Shapley & Muir, of Brantford, won the silver medal in the smaller gasoline engine class, and Sawyer-Massey received a nilver medal in the steam engine class. The greatest competition came in the class for the larger sizes of granline engines, and the number of large engines in the contest infracts that there is no illicitized of their being discontinued at an oarly date in favor of smaller trans-

The entire motor computation was carried out in practically the manner described in the SCENTRIC AMERICAN, June 29th. The exhibition officials had provided this year a new testing shed, with two new friction brakes securely anchored to beds of concrete. With this and other new equipment, the brake tests were run off without delay. The two-hour commony tests showed a vast improvement in the fuel efficiency of the leading egines. Little criticism can be made regarding the handling of the economy brake tests, as all apparatus were so arranged that spectators outil keep close check on all readings as to fuel and load, and there was little possibility of error

A half-hour maximum test was given cach engine, the idea being to ascertain the highest amount of power that could be turned out continuously without causing the engine to show distress. Points wave given on the steadiness of running, the condition of the engene, and for the excess of horse-power developed in the maximum test over what was developed in the

(Continued on page 124)

THE great annual Motor Contest at Winnipeg is over and the addition of foir great table of definite information to that already brought out on the farm tractor, is a notable event in the technical world. Competition this year was keener, if anything, than ever before, and although some of the contestants in earlier meetings dropped out, the newer ones who took their places showed that they were rapidly overtaking the former leaders in felicions. The Winnipeg Motor Contest can hardly be said to have that diversity of interest that marks the contest in France, because

The Winnipeg Motor Contest oan hardly be said to have that diversity of interest that marks the contests in France, because under the conditions named there is little encouragement for the appearance of such a variety of types as were seen at Challes last March. The American farm tractor has become practically standard in so far as the method of attaching the plows or cultivating instruments is concerned. The direct traction method prevails, and all of the tractors seen in the contest at Winnipeg were those having separate plows attached by chains to a farwher at the rear of the

engine.

This does not mean that the Winnipeg Competition has not brought out new types of machinery. Indeed, it is the one big event of the year, where the fond inventor to builder proudly brings forth his creation to find out how it compares with those of established reputation. Somotimes the new comers give a remarkably good account of themselves, and frequently all "dopp" is upset by truly remarkable performances of some new mechine. Last year the four-cylinder Aultman-Taylor gasoline tractor, which many, even of the technical visitors, saw for the first time at the Contest, gave the gold medal winner a close run, and this year two tractors of the same gueend type wor, respectively, a gold medal in the class for larger gasolines of large three Machinetts of the same purchased to the proposed of the same gueend tips were for the first time with the same of the same spices in and with the maller type wor a gold medal in competitions with everal makes which have been represented in previous competitions.

The Holt-Gaternillar a measing measurements and and the maller three of the same measurements of the maller three of the same machine the maller three of the same three of the sa

represented in previous competuous. The Holt-Caterpillar, a machine very similar in appearance to the Lefebre tractor pictured in the Schrattic America. Superlangers, June 29th, made a notable record in plouing after a less fortunate brake test. It demonstrated the efficiency of the peculiar type of traction wheel and would have received a silver medal in the larger gasoline class but for a penalty of 39 points for failure to be ready on the brake test—a failure due to the shortcoming of an expert who was intrusted with the pre-liminary work of getting ready for the Contest.

A four-wheel-drive tractor, made by Heer Engine Company, demonstrated great tractive efficiency in various ways, but unfortunately met with an secident to cone of its drive chains while assisting a competitor out of a mud hole in the prairie, and was somewhat handicapped in the Contest. The American Gas Tractor was also a new comer had showed up very nicely as to construction and power, although soored quite low for a high flast consumption, which should disappear with further refinement.

Among the older competitors the J. I. Case Company had things practically its own way in the steam anglue classes, having the only anglue in sach of the two similar obsases and a communication was

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# A Plan for Converting the Sahara Desert Into a See

### What Would Happen if the French Flooded the Great Desert

By G. A. Thompson

A SENSATION was recently caused in Paris by the descript, who declares that France ought to be no time in converting the vast desert of Sahara into an inland soa. He claims that, since "about a quarter of the whole desert area lies below sea level, the construction of a canal some fifty mine long through the higher land of the north African coast would immediately create a Sahara Sea equal in size to about thalf the extent of the Mediterranean." This canal, he states, would present no great mechanical difficulties because the coast land is composed of sand and soft rock formations.

The consequences of such engineering, he declares, would be gigantic. All the and regions now surrounding the desert and those parts of the Sahars which are above the level of the overan would be rendered as above the level of the overan would be rendered as effectile as Europe, since the present sterile condition is due to no fault of the soil but ts caused solely by lack of water. Millions of bumns beings could then support themselves in comfort, who now lead a miserable existence on the verge of star vation.

istence on the verge of star vation. Moreover, a great new colony could be added to the possessions of France, of which the political and economic importance can hardly be overestimated. A first of steamers would navigate the Sea of Sahara, and produces a fournaing traffic between Algeria most remarkable result of all would be the alternation of the climate of all northern Africa from equatorial extremes of heat to the pleasang temperature of Natal, thus enhancing its value as a place of colonization for Europeans.

Port. Richogogoun's some is pro-

Prof. Richegoyon's swheme is providing much comment, and objections are not wanting. Certain meteorological experts ory out in horror that any tampering with weather conditions in Africa would transform the climate of Europe. The commentary of the comment of the comment of so many billions of th

water, the equilibrium of the earth would actually be affected, and that the engineer who had undertaken the task of adding a new sea to the map of the world would forever afterward be cursed by humanity for having attered the axis of the globe.

On the other hand, various savants consider that these objections are illusory; that the possibilities prophesied are much exaggerated. These men are rejoicing in "another magnificent idea originated in that country which conceived the Suez and Panama canals." The time is near at hand, they claim with enthusiasm, when "the parched ground shall become a pool" and "the desert shall blossom as the rose," as forested by the Herberw seer centuries ago.

Considering the broad interest and influence to be cetablished by the undertaking of such a scheme, and the remarkable confliction of opinion concerning its

Considering the broad interest and influence to be established by the undertaking of such a scheme, and the remarkable confliction of opinion concerning its effect, some popular statement of Saharan conditions a spropos at this time. The frigid zones and the "High-lands of the World" have occupied so much of the public attention during the part few years that only the vaguest thought has wandered toward this "last the great desert of Africa, nor one about which so little is generally known, nor concerning which so many faccinating myths are told and believed. Since the earliest records of history it has been a place of sublima mystery, of dread and world terrors, of strangs and impossible happenings. From the pyramids all the way across the continent to the Atlantic Ocean it records and what is it like, what fearful secrets does

tt.hide? In reality, the Sahara is not so fearful as it is grand and wonderful, as the ocean is wonderful, or any other expression of nature on a gignatic scale, and like the ocean it can be tamed to the service of mankind if approached in proper fashion. Notwithstanding the fact that the desert has been

Notwithstanding the fact that the desert has been traversed from time immemorial by native tribes carrying fruits and silks and costly woods and ivory for barter from center to coast settlements, and still is crossed at certain points by important caravan routes, it is even to-day almost entirely unexplored by eivilised men. Sir Lamber Playfair, Dr. Erwin von Bary, De Lens and a few others have partially explored certain protions of it during the past twenty-cine years, yet there still remain large tracts of the territory that have nearly heavy risend by twitte men.

men. Sir Lambert Playfair, Dr. Erwin von Bary, De Lenz and a few others have partially explored certain portions of it during the past twenty-nine years, yetthere still remain large tracts of the territory that have never been viewed by the eyes of any white man. Topographically, almost the whole northern half a Africa is a desert, in which Egopt and fertile for of-Africa is a desert, in which Egopt and fertile for our tainous tracts along the Meditarranean may be regarded as large oases. Geographically, there are three deserts the Nubian, bordering the Red Sea and reappearing

MOROCCO

MAGERIA

TRIPOLI

SAHARA OR GRANA

OR

Map of North Africa and the Great Desert, showing the topography that would shape the Sahara Sea.

across the see in Asia in the Arabian Desert, the Libyan, between Ferzan and Egypt, and Sahara or the Great Desert, which includes a number of small and tracts that extend like leng arms far inso the fertile regions north and south of its principal body. The last presents a vast undivided waste almost two thousand miles in length from eastic over, and nearly one thousand in average breadth from north to south. This messes as approximate area of 3,995.00 square miles, one equal to the whole of Europe, without the Seandinavian peninal. Politically, the Sahara belongs to the various countries which border it or which exercise a protectorate over land that it is near. Hence, Morocco, the Turkish Empire, Italy, and, through Algeria and Tunis, France, own sech its neighboring portion; but by far the chief part of the territory belongs to France along with the French Kongo can due coaleave and the Sahara should be supported to the territory and the Sahara should be supported to the territory and the Sahara should be supported to the territory and the Sahara should be supported to the

Empire, Italy, and, through Algeria and Tunis, France, own seah its neighboring portion; but by fat the chief part of the territory belongs to France along with the French Kongo and the colosy on the Senagai.

The Sahara Desert has several very curious features. The most remarkable is, perhaps, its distinctness of boundary. Standing on the southern slope of the Atlas range, one looks out upon what has almost the appearance of a boundless sea, which forms, as it were, a nold coastilen along its northern sign, whose sheltered bays and commanding promenteries are completely as eries of towns and villages. Toward the south, as in Morocco and Algeria, the deserts comes to a close in some localities as suddhup as if it had been out off with a knife, in others it message gradually into the well-messed and fartific lands of this fixeden. This co-like aspect of cereian pagitions of the fishers. In the general appearance, and has even affected the ideas

and phraseology of some elegatific vertices. Its is used at all the low and-plain then it is used to reason the life in table a certical of the more window analysis of the life in life in the life in the life in life in the life in life in the life in the life in the life in the life in life i

This is the region which from the highlands of Aigeria and Morocco looks so much like a storm-tossed sea. The dunes in all parts of the Sahara

The dunes in all parts of the Sahars ile generally in long undulating lines, very like the billiows of the coean, with gradual slopes to windward and an abrupt descent leavard. They are usually sixly to seventy feet in height, but are said to attain in some places fully three hundred feet. The sand that forms them is exceedingly fine, belag, in fact, the dust of rock battered and prowdered by the action of centuries of fleroe winds and rainless heat by day and sharp chill by right. In this condition every slightest breese is sufficient to raise it in choking clouds, though the amazing reports in sufficient to raise it in choking clouds, though the amazing reports of frightful sand-storms which overwhelm whole caravans being the common thing in the desert are mere fairy tales. Under the influence of frightful sand-storms which overwhelm is such that in topographic disage, of course, but their equilibrium is such that in topographic distribution they are comparatively permanent. Some of them even have names of their own, like the Geru (peak) al-Shief and Gern Abd-ixCaster to the south of Goles in

Algeria.

The color of the sand dunes on masse is a rich golden hue, which gints and gleams in the glare of the sunlight with a dazding strongth. Each individual grain is reddishyellow from the presence of iron, and generally everability from have

yaulow from the presence of iron, and generally crystalline from having once formed a part of soft quarts rock. Gaeiss and mios schists, granite, limestone, sistes and besait all appear in the rocky formation of the Sahars, but the relative proportion of their distribution is not yet fully known. In the central part of the desert south of Algeria there are large extents of red sandstone formations, whose dust carried seeward by the winds osseliations, whose dust carried seeward by the winds osmestimes over certain parts of the Atlantic, and sometimes over certain parts of the Atlantic, and notably over Algeria, without arising to produce the peculiar red sky effects noticed sometimes over certain parts of the Atlantic, and anotably over Algeria, without arities in ourself results of the aritim to study and copy the marvious combination of rich orimsons and purpless and amber. Such sand—produced by the fracturing and amber. Such sand—produced by the fracturing and armount of the cliffs through alternate daily heat and rapid radiation in night—is an active agent of the which is the control of the homesode as smooth as fee. Elsewhere which is the second the revitical faces of the cliffs with outions initiations of glacial striation and has beinged to undertain the same of part or "witnesses," are among the most hassillar products of Saharan creadion.

out the pillars or table-like eminences which, under the name of pure or "witnessee," are among the most handless products of Saharan erodon.

As to the elevation of the Sahara, some responsible general estimates have been indee within the past few years. The Upper Sahara consists of a rocky plateau, ower deep than thirteen kundred fest high, which risses at deeps in considerable peaks; the lower, to which is plateau fewer than thirteen kundred fest high, which risses at the plateau fewer than the office of the plateau fewer than the office of the plateau fewer than the office the plateau fewer than the own than the office the plateau fewer than the own that the own

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### Correspondence

12the editors are not responsible for statements unto the correspondence continue. Anonymous comthe correspondenced, but the names of leadonts will be withheld when so desired.]

### Information on Plumbing.

### To the Editor of the SCIENTIFIC AMBRICAN:

To the Sixter of the SCREPTIFIC ARRICAN:

"A Transition Jasprovenment Wanted," page 113, issue
of Switzmary Red, 2012. Please inform "master plumber"
likes the should make a globe of thin copper, then cover
with listlis rubber for the valves. These would float all
right and resist external pressure, and the outer covering
in the subber would make the water-tight joint when
lower Wan. McDaarra,
lower Wan. Fellow Che mical Society

Minibertey, Cupe Colony, Africa.

### The Lamey Waterwheel

The Laney Westerwisches

The balling of the Source-recover Assessment:
In your tense of april 19th, page 386, referring to
the Laney waterwised, you state that it was built
about 1868.
I want to the fate of Man in June, 1889, and want
to Laxey in Supplember to visit the Saud infines there,
and at that time the great wheel had been at women
some few years; how many, I salmon toow remember,
after such a long lapse of years. The above date in
the more find in my memory, as I was then a boy
of sighteen, and this journey to the laie of Man was
my first tob. of sighteen, and this journey to my first job. Itajulis, Minas Geraes, Brasil. THOMAS J. WOOD.

### Restraining the Floods

To the Editor of the SCHRITTPIC AMERICAN: Just finished

I have been a subscriber many years. cle on the Mississippi River (May 25th, page 765). You have a very good illustration for a levee.
The writer piloted on the Mississippi River and the Ellinois River fourteen years. Lived in Cairo, Ill... Was mayor of that city from 1895 to years. Was mayor of that city from 1895 to In 1896 took a trip through Europe. Noticed many the farms were ditched in sigzag fashion; 1897. ditches from eight to ten feet wide and about same depth; many miles across the country. They plant willows all along the banks of the ditches. The young sprouts are made into trunks and baskets, which is a

very large industry.

se ditches really form a grand system of irriga-The crops looked fine—healthy and abundant. ton. The crops looked fue-healthy and abundant. Water runs along slowly, avoiding the rush of the water runs along slowly, avoiding the rush of the water into creeks, and rivers have water all summer. In our country we dig straight ditabas, which produce overflows during spring freshets, that increase each year as the lowinside are opened up for oulitivation. I can remember rises at Cato, III., with high-water marks of 45, 47, 52 feet, and this year 54 feet from low-water mark; a steady increase each flood year. When you think of making levees in the years to come, I doubt if the States or Government combined can build levees of sufficient height to protect the Southern States, without bankrupting the States and the Government; and with the best of levees there is a continual danger of breaking some of them.

Lookport, N. Y.

### The Wireless Meddler Again

To the Editor of the SCIENTIFIC AMERICAN: While the action of the SCIENTIFIC AMERICAN:
While the question of amatour interference on the
Atlantic coast is under discussion in your correspondence
columns, I feel that it might not be amiss for me to
add what information I can as to the situation on the

Amateur stations are as plentiful in the neighbor hood of San Francisco Bay as anywhere in the country, and I cannot but feel that the conditions here are a fair example of what is to be met in any part of the

I had the good fortune to be listening in at the time of two separate distress messages from vessels here. On the first occasion, the steamer "Beaver" had rammed of two separate distress messages from vessels here. On the first consation, the steamer "Beaver" had rammed the Norwegian tramp "Selja" and barely succeeded in resource her crew before she sank. The "Beaver" havelf was budly damagued, so that the captain felt is preident to call for ald. At the first S.O.S., nearly every station, amakeur and professional, within reserving distance started to assive, but within three mixtures of the first still fer help, the United Wirelons station at their Praisibles heft a fixer fine, and were contempting messages as first, as the superstant sould be welled, the station of the present the station of the present the station of the stations of the financial stations had been superstant of the stations of the financian heat of the stations of the financian heat of the stations of the financian heat of the stations of the stations heat of the stations of the stations of the stations heat of the stations of the stations of the stations heat of the stations heat of the stations and the stations of th

times to do so. To my mind, the first restrictions to be placed upon wireless work of any kind should fall upon these wireless telephone companies, since the range of disturbance that they create is far greater than that of the average amateur.

The other distress message which I happened to ar was from the ste mer "Queen," which had caught fire in the foreward hold The messages in this case re given religious consideration by all amateurs

Either the nary station on this coast differ widely from those on the Atlantic, or somebody is mistaken when they claim that apparents in such places is antiquated. I know of no better apparents than the Telefunken sets now being installed at the Government stations. And as for constants. runken sets now being installed at the Government estations. And as for operators, the average Government man, on this coast, at least, can rank with the best in the world. In any station, however, local interference may at times prevent the reception of messages clearly audible at some other nearby station. I think this will explain Mr. Powell's statement in ard to this matter

regard to this matter.

Legislation on this subject should only be undertaken with a full knowledge of existing conditions, and of how to better them, and petitions signed by those entirely igneem to the situation should not be granted say weight in deciding this matter.

FRANK RIEBER. Berkeley, Cal.

### High Speed Through the Ice Fields

To the Editor of the SCIENTIFIC AMERICAN:

The editorial upon this subject in your number for July 6th, with its conclusion that high speeds will probably be maintained in the future, raised a line of thought in my mind which I have not seen heretofore discussed. The iceberg which was fatal to the "Titanic" was, I believe, discovered by her lookout about 30 seconds before she struck it. The "Titanic" was traveling at a speed of 22 knots, and the berk vas, therefore, originally seen at a distance of 1,100

e, what is approximately the fact. that the radius of curvature of a vessel's track, when dder is turned, is the same at all reasonable
Then if the rudder of the "Titanic" had been instantaneously turned, it would have made no difference at what speed she was going, she would have fold precisely the same course, although the amount of damage inflicted would naturally have differed some what with the speed of collision. If at less speed the radius of curvature were somewhat larger than at high, which is really the case, the berg could have been more surely avoided at the higher speed.

The point which I wish to raise, however, is that the rudder could not possibly have been instantaneously turned. After the lookout first glimpsed the berg through the darkness, it took him an appreciable time, let us say 5 seconds, to make up his mind that it really was a berg, and to shout to the officer on the bridge To attract the officer's attention, for him to receive the information, and to step to the engineer's signal, required let us say 5 more seconds. To call the engineer's attention, and to transmit the signal to change the course of the ship required, let us say 5 seconds. To turn the lever and shift the rudder by the required amount required, let us say, 5 more seconds; 20 seconds in all, out of the possible 30. Some of these estimate may be too large, and some too small, but the total 20 seconds cannot be very far out of the way. The ship, therefore, had 10 seconds left, after the rudder

as completely turned, in which to change her course.

If now she had been going at half speed the berg would still have been sighted at 1,100 feet distance but it would have taken the ship 60 seconds to reach it, and the vessel would have had 40 seconds in which to make the turn to avoid it. When she first began to turn she would then have been twice as far from the berg, and since for small arcs the deviation, 1varies as the square of the arc, had she followed the same radius of curvature, at the end of the 1,100 feet she would have been four times farther from her original course than if she had gone at full speed. Even if the radius of curvature of her course were twice as great, she would still have been twice as far from her original course. This would certainly have saved the

Mr. Ismay's point that the higher the speed the less the danger, because the ship would the sooner be through the danger zone, does not appear tenable to As applied to fog there is undoubtedly an the writer. element of truth in it, because one of the dangers of feg is that of being run down by other fast boats. The fog is that of being run down by other fast boats. The binger you stay in a foggy region the more boats will dross your traits. A slow boat should get through a fug just as quickly as she can. With ice this is sist the case, since this speed of the ice compared to that of the skip is so small as to be practically nagrigible. We may consider it merely as so many islands. All the danger depends on the ship herself. Consequently, the element of time does not enter at all, only distance. Whether she is but one hour or ten hours in the ice is equally dangerous, provided her course is the same

In conclusion, I would like to add that while the large boat is undoubtedly more economical to run, more stable, more luxurious, and in some respects safer than the small one, yet when it is a question of either fog or ice, the smaller one has the distinct advantage that while the obstacle is visible from both ships at the same distance, the smaller one can in the same time, even if going at the same speed, change her course through a greater amount to avoid it, and is, therefore, in this respect the safer of the two A smaller boat could undoubtedly have avoided this particular berg William H. Pickering.

Harvard Astronomical Station, Mandaville, Jamaica,

### The Cause of the Quimby Accident

To the Editor of the SCIENTIFIC AMB

You will recall that in the July 20th issue you published my account of the Quimby accident. Unders t you gave the substance of a conversation with Miss Quimby's mechanic.

In spite of the general misunderstanding on this Quimby accident, I believe there was never anything clearer. Let me furnish you some further evidence.

When I went to the heat to examine the wreck of Miss Quimby's machine I asked Capt Chase, acting chief signal officer of the United States Army, if he would accompany me, as he had been sent by the Gov ernment to pick up whatever he could at the aviation meet. He did so. As we were rowed out to the wreck he asked me whether I noticed that the machine had turned to the left and that Miss Quimby and Mr. Willard were not only thrown out, but to the right I said that I had noticed this Mind you, all of this occurred that I had noticed this Mind you, all of this occurred before we had seen the wrecked monoplane. In other words, we had both agreed that the machine turned to the left just as it plunged downward.

When we reached the wreck I scrambled on top of it, and the first thing I saw was the rudder wire caught over the lower end of the warping lever. The mechanic had come out in another boat, and he, too, climbed onto the wreck I pointed out the caught wire to him, and the wreck I pointed out the caught wire to him, and he held up his finger, and said, how did I know that the wire was caught in the sir? He went on further to say that he believed it had been caught after the machine struck the water or on the way down. I replied that of course that question could never be settled, but the fact that it was so caught proved defectsetties, but the ract that it was so caught proven detective design. He then, in the presence of myself, Capit. Chase, and Mr Thoradike, who rowed Capit. Chase and myself out in his little boat, unhooked the wire from the lower end of the warping lever.

I cannot see how he could be so short-sighted as to say that he did not do this, or that the warping lever

In my own defense I have written to Capt. Chase and Mr. Thorndike and asked them to give me an affidavit stating that the wire was caught as I indicated. I inclose copies of the affidavits.

If you examine my sketch, you will see that by the wire catching as indicated the rudder would be thrown to the left and the monoplane turned toward the left as it plunged downward. Does it not seem that it is something more than mere coincidence that both Capt. Chase and myself agreed before we knew anything about this caught control that the aeroplane turned to the left?

I have plenty of evidence to prove that the wire was caught as I say, and it seems to me that the cir-cumstantial evidence goes to prove that it was caught in the air. However, there is one thing that is certain, and that is that the machine should not have b structed so that the wire could have become caught under any circumstances whatever

In justice to myself I would much appreciate it if you will publish this affidavit of Mr. Thorndike's with the statements which I have made in this letter regarding the fact that Capt. Chase and myself both agreed the monoplane turned to the left before we knew any-thing about the controls being caught.

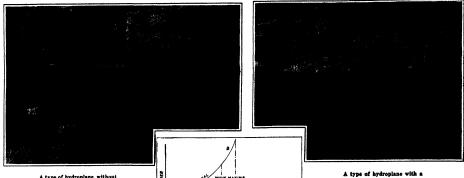
The idea of Willard jumping out or falling out is all nonsense. As the tail of the machine went up and to the right he was thrown out twenty-five or thirtyet as a hundred witnesses will testify. that he went much further than Miss Quimby is, of course, easily explained when one realizes that he sat nearer the tail than she did, and because he went so far it gave the idea that he jumped. Assuming he had wanted to jump from a monoplane moving seventy miles an hour, he could not have jumped twenty-five tiet. With the wind resistance against his body it rould have been about all he could do to flop over the ie of the machine, but as it was he was thrown far

some or the machine, but as it was ne was kirown as up and out, while Miss Quimby went below him. Newton Highlands, Mass. EARLY L. OVINGTON. [The affidavits of Mr. Thorndike and Capt. Chase referred to by Mr. Ovington, have been received. Thay agree with his account. Lack of space prevents our publishing them.—Epron.] 

# What is a Hydroplane?

The Evolution of a New Type of Craft

By Joseph B. Baker



A type of hydroplane without a sharp forefoot, and planing.

THE attainment of high speed in water craft has the men in ascinating problem ever since man began to centure upon the water. The cared vessels of the ancient maritime peoples, propelled by many galley-slaves laboring at lenins of ones, the triemes in which the sea battles of the directs and Romans were fought, the speedy our and sail ships of the Norse Viklings, the war cances of the American Indians, were all pushed hard upon occasion, to get the utmost possible speed. But these craft one and all were creatures of limitation; the boat, man's water-spoing invention, could not hope really to command the sea until steam became available for marine propulsion, replacing human muscle and the capricious add of the wind by a mechanical power which could be increased indefinitely

The application of steam opened up a new era though vessel speeds were grently increased, the ability to eat up the miles on the water as the railroad train does on land was by no means attained thought that the speed of an engine-driven vessel would be morely a matter of motive power—that in order to increase the speed one must simply put in a larger, more powerful engine. But such is not the case, as the designers of steam craft in the first few decades following Robert Fulton's great demonstration soon No fur from the speed of the ves proportional to the engine power, or in anything like that ratio, it was found that above a certain speeddepending on the design of the hull-it did little good to increase the power. The work of the engine, delivered through side wheels, stern-wheel or propeller, was expended in urging the mass through the water on which it floated. The ordinary boat is a structure which sinks till it has displaced a weight of water equal to its own weight, and in all boats this means that the immersed surface presents a considerable resistance to the forward urging of the wheels or pro-peller. Shaping the surface to give the easiest possible passage through the water by refluements of marine architecture based on the study of stream lines, fluid fric tion and the friction of the supporting fluid on the surfaces of the immersed part of the hull, reduces this re-

Span has been specially special specia

Fig. 1—Diagram indicating roughly how the power required to drive a boat rises with the speed, due to wave-making of immerced surface Fig. 2—Diagram showing the upward thrust due to motion of plane at an angle with the reasteting medium Fig. 3—Single-step and two-step hydroplanes.

iardation. But with the eastest sliding hull that could be built to give the required displacement consistent with seworthiness, there is an inevitable limit to the incrosse of speed with increase of power—a limit beyond which it does not pay to put in a larger captine simply because at most a trifting increase of speed is obtained at thereby. Any attempts to exceed this "critical speed" result in an athornally heavy and bulky mottre power and correspondingly great weight of fuel required to to carried and spec altoted to fleel, a condition limited in to carried and appearance of the fleel and possible only in war vessels and ruching boats, where high speed at any cost is the ruling consideration.

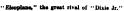
The introduction of gas engines as motive power, the introduction of gas engines as motive power, the ten years, the motor boat, helped the speed problem wonderfully by enabling a much larger power to be realized from a given weight and space of material in the engine and in the fuel carried (gasoline). Motor boats have set an entirely new standard of marine speeds through the use of an engine which is of small weight and size compared to the steam engine with Its boiler and coal, and which allows the huil to be designed with finer lines. But notwithstanding the extension of the speed possibilities thus gained, the full resistance of the huil as an immersed surface largely remains to limit the speeds attainable. In brief: As long as the craft presents a considerable immersed surface it must be driven if arough the water, and, therefore, encounters a resistance which rises very rapidly with the speed. Without dwelling on technicalities we may note in passing that the fluid resistance to a beat's motion is made up of two parts, vis. surface friction and wave-making. As shown roughly in the annexed diagram (Fig. 1), whereas the surface friction (the lower ordinates) increases as the square of the speed, the power consumed in wave-making increasing traff rate of increase. This wave-making resistance is due to the displacement of water by the moving hoat.

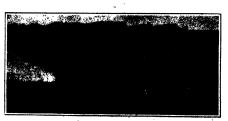
But if one can avoid driving the craft through the vator at all? If we can drive it over the water we can largely reduce the displacement resistance, which cuts such a figure in an immersed boat, and at the satisfaction, makline very considerably reduce the skin friction, making our curve of power consumption approximate curve A with short ordinates, since the immersed surface is much reduced. Then we shall be utilitating the principle which keeps a well-thrown "skipping-stone" drying for a long distance over the water, just as the acroplane utilizes the principle which keeps a kite alort.

which keeps a well-thrown "skitpting-stone" flying for a long distance over the water, just as the actoplane utilizes the principle which keeps a kite aloft.

The very counciousness of a need leads to its supply. The step from the ordinary bost to the hydroplane has been taken in response to the need of higher speed on the water, just as the step from the balloon to the acryplane was taken in response to man's need of control and speed in the air. Both of these improvements have come from abandoning the supporting quality of mere volume displacement; and utilizing the supporting quality due to resistance to a plane driven at high speed. The hydroplane has a bottom structure which, though heavier than its displaced water, yet stays on the surface like a skipting-stone by constantly moving the state of the same o







"Vita Jr.," the intest 1812 type. Note the front ruilder.

on the water; the aeroplane is a heavier-than-air struc on the water; the seropiane is a newtwi-casar is true-tine which stars up like a kite by continually moving against the air. The hydropiane is upheld because its velocity develops a sufficient upward thrust of the water over which it is passing, just as the aeropiane is upheld because its velocity develops a sufficient upd thrust of the air through which it is pass

The state of the s

The hydroplane is a vessel designed for two features of performance: 1. To rise out of the water when driven, owing to a very strong upward thrust on its hull and a light total weight which the upper thrust our lift. 2. To offer the minimum friction resistance at

These features, in a craft having powerful gasoline engine and manned by a competent crew, result in high speed The hydroplane is driven faster than an ordinary boat, by an engine of given horse-power, because it is lifted up on top of the water and kept there; the power of the propeller exerted to drive the craft shead also develors an annual states. shead also develops an upward thrust on the hull by reason of the plane bottom of the hull. Let us look more closely at this matter of upward thrust. Consider a heavy plank or plane, driven through the water in a direction making a slight angle with itself. The total resistance to the direction of motion may be resolved into components, one parallel to the plane and one normal to it. The former involves the skin friction; it is the latter which involves the levitating action of the plane Let A, Fig. 2, represent the plane, and M this normal component which we may resolve into two components Ox, a hori-sontal drag tending to retard the motion of the plane, and Oy, a vertical lift on the plane. If now the speed of the plane is high enough in proportion to its weight, that is, if this component Oy is great enough to lift the weight of the plane, the latter will rise. The diagram shows that in order to obtain an advantage from the use of such a plane fixed on the bottom of a yeasel, the benefit of the lift due must outweigh the drag and friction of the same—the latter diminishing, of course, as the craft rises on account of the diminution of immersed sur-It is all a matter of the ratio of wer of the craft to its weight. itself is not new; plane boats equipped with powerful steam engines had been built before the present hydroplanes. but until the gasoline engine with its high weight efficiency was applied to motor boat propulsion, the weight of the power plant and of the hull required to contain the same was too great for the With the gasoline engine, itself of light weight for large power and capable of installation in a light hull having a bottom designed with one or more planes, the lifting energy was able to force the structure up out of the water; and the characteristic high speed of this craft at once resulted, owing to the reduction of wave-making and surface friction.

It is instructive to trace the perform ance of the hydroplane, its position with regard to the water as the speed is increased from zero to the maximum of which the vessel is capable. Take the simplest construction, the so-called monoplane (upper sketch, Fig. 3). At rest, this craft floats in the water like any other boat, being supported by its static buoyancy. When the engine is started, the resistance of the plane bottom causes the bow to rise; but ordinary buoyancy is still the ruling factor, and the stern sinks until the additional immersion of the after part displaces enough volume of water to support the boat. As the speed cases, the further rising of the bow was the center of upward thrust back. until it reaches almost to the center of gravity of the craft. At this stage of the speed, since the point of support is very near the center of gravity, the boat ready to pivot vertically, so to speak, on this point; and with further increase of speed the boat, powerfully upheld by the vertical component of the fluid pres-

Sit

sure on its bottom, drops its bow, but raises its stern. till its bottom rests on the surface of the water at a small angle therewith, and with very little displacement of water compared with that in the position of the boat when at rest. The main factor is no longer static buoyancy, but the new lifting force due to the speed of the boat. This is the planing position, the power of the engine is showing a speed which could never be attained in an ordinary boat with a displace ment hull. If the speed is still further increased, the bow may be sharply depressed, causing the craft to headlong. The hydroplane may be built with



A hydroplane at low speed, not planing.



"Baby Reliance." a new type for 1912. Built in May.



The "Saurer Lurssen" hydroplane at full speed.



20-foot "Divis Jr.." with a speed of 43.78 miles per hour.

a single plane or "step" or it may have two or more a single plane or "step" or it may have two or more steps, as shown in Fig 3. These are over-water hydro-planes. A type in which the upward thrust is given by totally immersed planes has been successfully dem onstrated by Mr. Peter Cooper Hewitt in this country and by Signor Enrico Forlanini abroad. over-water hydropiane that we owe the phenomenal advance in boat speeds in recent years. The 21 miles per hour of the "Vingt et un" ten years ago, a speed unheard of up to that time, has to day been more than doubled, the "Dixie IV," the fastest boat in the world, making 46 miles. Attention to detail, refinement of design and the cutting down of

weight enables this American-built craft of 500 horse-power to best foreign bosts having over 800 horse-power The same ed qualities are shown in smaller boats speed qualities are snown to smear of this type also; a craft new this year and only 20 feet long has shown a speed of 38 miles per hour

The average of five runs in a speed trial of the 20-foot "Dixie, Jr," hydroplane, over a course one mile long in Newark Bay, June 21st, showed a speed of 43 13 miles per hour, the best performance being 1 minute 22 1/5 seconds for the run north, which figures out 43.78 miles per It is safe to say that this speed is as fast as any 20-footer h s ever traveled is owned by Mr man, Next year may show us 50 This boat is owned by Mr Harry Payne Whitney. miles per hour in a 40-foot boat of the Government tanks at Washington, D. C., for testing out large-size models has been of great assistance in develop-ing the lines of these vessels. This year will see our British cousins here againtheir challenge has been received—to try to win back the Harmsworth trophy; and to win each the Harmsworth (rophy; and there may be other foreign boats in the contest. Will some scientific American prove equal to the task of defending it?

### The Value of Radium

THERE are no very exact statistics of radium available, but according to the United States Geological Survey the whole quantity in the world is probably not over two or three ounces, and its value, like that of the big diamonds of the world, is purely nominal. It is worth whatever the ors can get for it. The head of the English corporation producing radium claims that it is worth approximately \$100,000,000 a pound A year ago this same person had estimated the value of radium at one third more However, a little variation of \$50,000,000 is not thought to matter where there is no ap-preciable fraction of a pound of the precious stuff in sight. The fact that has more than anything else to do with fixing the price is the existence of several radium banks in the world where tubes con-taining a microscopic speck of radium are rented out to doctors at something like \$50 a day. While it is known to be of some value in treating lupus, which is a form of tuberculosis attacking the tissues, usually of the face, there is little known about its medical value has been claimed on several occasions that radium was valuable in the treatment of cancer, but experiments have not proved this to be an absolute fact

A short time ago it was reported that the Austrian government had purchased the only two mines under private owner ship producing the ores from which radium is made, and thereby gained a mon-opoly in its manufacture. This report This report, however, turned out inaccurate It is true that the Austrian mines and the Austrian government heretofore have supplied the bulk of the radium salts existing in the world, but at the present time radium is being manufactured in three other countries, the United States included Sweden is producing radium from kolm, the English are getting it from mines in Wales, while we get it from west-ern Colorado, where there is a large deposit of radium-producing ore. These deposits produce also uranium and vans dium, the latter being used for making ne of the high-grade steel alloys. While the mining pays in vanadium alone, the ore produces a certain per cent of radium Ten tons of it procure only between twenty and thirty milligrammes of radium

<sup>&#</sup>x27;Nearly fifty years ago Mr. Bamus, a clergy man, conceived the idea of driving vessels over the water intend of through it, and cried his relected in the British Admirhalty expectations task at Torquay; but it falled because of the pose state of power to weight.

# The Flight of Projectiles

### The Actual Positions of a Shell from Gun to Target

By Rear-Admiral N. C. Twining, U. S. N., Chief of the Bureau of Ordnance

6 6 THE axis of a projectile in flight is at all times sensibly tangent to the trajectory." Sketch No. 1 shows the positions which a projectile takes in the dif-

rent parts of its trajectory.

A large number of persons believe, however, that the axis of a projectile in flight remains parallel to its direc-tion when fired These persons believe the positions of

the projectile to be as shown in sketch No. 2.

It will be sufficient for the present to state that the persons (of whom there are a surprisingly large number) are wholly in error, and that a projectile in flight cannot possibly take the positions shown in sketch No. 2.



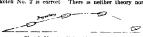
Sketch No. 1.—Shows actual position of projectile during flight from gun to target.

The discussion as to whether sketch No. 1 or sketch No. 2 is correct has continued for many years, and has long been considered a most question. It has has long been considered a most question. It has frequently been stated that authorities differ on this question. This is not quite true, for it will be found on investigation that all "authorities" are of the same opinion. There is absolutely no doubt that the believers in sketch No 1 are correct, and that those who believe in sketch No 2 are in error.

It is important to establish the correctness of sketch No. 1, as many articles and criticisms have been written on the premise that sketch No. 2 is correct, and consequently a great deal of mis-information has been placed in print, and a great many incorrect deductions have been made.

have been mane.

In investigating the flight of projectiles, it is not apparent why so many have been led to believe that sketch No. 2 is correct. There is neither theory nor



Sketch No. 2. False idea of posi-tions of projectile during flight.

fact to support such beheft the stated that owing to the "gyroscopic principle," a projectile will remain parallel to its original direction. The assumption is wholly incorrect, for although a rotating projectile is

wholly incorrect, for although a rotating propeellie is a gyroscope, there is no gyroscope principle which allows a propertie to remain parallel to itself while it is being acted on by the force of the air resistance. When a rotating propeellie is fired from a gun, the air resistance is at firsh head on, acting in a line through the center of gravity of the propeellie. This force merely rotatist he projectile. Reference to sketch No. I shows that the direction of the air resistance is continually changes.

the air resistance is continually changing. At first it is head on and downward, later it is horizontal; It is nead on and downward. Make it is notification and at the end of flight the air resistance is upward. The change of direction of the air resistance in the first part of the trajectory, may be taken as approximately 14 degree in a thousand feet.

After the projectile has traveled a short distance in

its trajectory the direction of the air resistance changes, bending toward the horizontal, the re-sultant force striking the projectile as at F', sketch No. 3. The force F' does not act through the center of gravity of the projectile, but for-ward of it, creating a small overturning



tion this moment would tend to overturn the projectile; but as the projectile is rotating, the overturning moment causes the projectile to begin to precess about a line passing through the center of gravity of the projectile and parallel to the direction of the force P'. This line is sensibly the tion of the trajectory.

scopic moment.

represented by F'

The force P' strikes under the point of the projectile, and if the projectile has right-hand rotation, it will start precessing to the right. The projectile behaves quite like a top that has not gone to sleep. The top is rotating, while its acts is precessing or wabbling. There is this difference, however, that the top makes a number of complete precessions, while the projectile angles only partial ones, as will be explained. It must be understood that owing to the high speed of rotation of the projectile (4,000 to 20,000 revolutions per minute, or even greater), and the relatively small overturning moment of the air resistance, the times necessary to make a complete precession would probably be one owners seconds, depending on the projectile, its speed of rotation, and the overturning moment. If the overturning moment decreases, the append of the processions rotation, and the overturning moment. If turning moment decreases, the speed of the p

Before the projectile has finished more than a of a complete precession, it has traveled several hun-dred feet, and the direction of the air resistance has again changed to P, striking the projectile slightly far-ther under the point. The first precession is arrested before more than a part of a precession has been com-pleted, and another precession starts about the new direction of the air resistance, the point of the pro-jectile again bearing off to the right (as viewed from the rear). As the direction of the air resistance changes the rear.) As the direction of the air resetance changes again and again, new precessions are started before previous ones are more than partly completed. The point of the projectist, therefore, describe a series of cusps, the horizontal traces of which are practically evoloids, appearing somewhat as shown in aketch No. 4. The point of the projectile for right-handed twist remains for the most pact to the right of the wettical

plane of the trajectory.

The overturning moment (which depends on the air resistance and the lever arm) is balanced in a sense by the speed of the precession. With a given speed of rotation of a projectile, if the overturning moment deases, the precessions become of greater period. As changes in direction of the air resistance are relathe oldings in direction of the air resistance are reas-tively small, and as new processions are started with every considerable change of direction, it follows that the amplitude of the processions is small, and the axis the amputude of the processions is small, and two axis of the projectile never diverges more than a few degrees from the trajectory As the projectile reaches the latter part of its tra-

protory its speed of rotation diminishes but slightly, while the overturning moment falls of very greatly, while the overturning moment falls of very greatly, due to the large reduction in the six resistance. The processions in this part of the flight are, therefore, slower, and of greater amplitude. This is indicated in skitch No. I haddition to the overturning moment caused by In addition to the overturning moment caused by the resistance of the air, there are also frictional forces which oppose the rotation of the projectile resistance, and the effect over the whole projectile may be represented by a force at each ead of the projectile setting in opposite directions, as shown in sketch No. 3. These forces are the equivalent of a force f-f, scing through forces are the equivalent of a force f-f, scing through the coster of gravity, and a sought sending to depress

forces are the equivalent of a force f.f., acting through the center of gravity, and a couple tanding to depress the axis of the projectile toward the trajectory. As soon as the axis of the projectile becomes tangent to the trajectory, the friction forces disappear, as the friction them becomes symmetrical about the axis. The force f.f. moves the projectile bodily steewise, and is one of the elements causing drift. The friction couple assists in becript the axis of the projectile towards.

couple assists in keeping the axis of the projectile tan-

couple assists in keeping the axis of the propertie tan-gent to the trajectory.

This friction force is quite like the friction acting on the per of a top. The axis of the top is finally brought into line with the direction of the force of gravity by the friction on the peg soting at right angles to the

the friction on the peg acting at right angles to the force of gravity, no proof, theoretical or otherwise. There is absolutely no proof, theoretical or otherwise, that a projectic in flight will remain parallel to its direc-tion when fired, while the theory of gyroscopes show plainly that the direction of the axis of the projectile must deprese continually to meet the changing direction of the air section. of the air resistance.

In addition to the theory, the following tangible proofs show conclusively that the axis of the projectile is at all times sensibly tangent to the trajectory:

(a) Cardboard impact.

(a) Cardboard impact.
(b) Photographs.
(c) Reports of observers.
(d) Reproduction of motions with air currents and model projecting.
(e) Panetration of armor.

(e) Penetration of armor.
(f) Retardation of velocity in flight.

Card

It is evident that if a projectile in flight should by target which offered practically no resistance, the prjectile would pass through the target whould pass through the target a hole inflessificated, and would make in the target a hole inflessificated, and would make in the target a hole inflessification.

faceted, and would make in the target a hole indicating the position of the projectile in flight.

In Outober, 1909, at the Naval Proving Ground, Indian Head, Md., fing took place with an 8-inde pau at a card-board soreen, the range being 7,600 yards. The angle of elevation of the pun was about 9 degires, 30 minutes, and the angle of 6,111 3 demand 45.

fall 13 degrees, 45 Refer nce to sketch No. will show that if the projectile had remained par-allel to its original long hole have been would made in the cardboard about 15.35 seconds in length. made in the card board was practic-ally circular, hav-



ing a diameter of about 8.23 sec. Sketch No. 4.—Path of point of pronds. This evi- jectile, shown on horizontal play

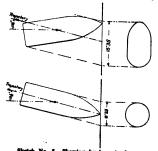
dence is conclusive that the axis of the projectile must have been practically

tory.
Photograp During the target practice of the Atlantie fact in the spring of 1912, actual photographs were taken of large-culiber projectiles in flight. The photographs were taken after the projectiles had traveled about 10,000 yards. In all of these photographs the projectiles are seen traveling point down, with their axes practically in the trayectories. Measurements showed that the axes

projectiles at this range diverged less than 2 degrees from the tangents to their trajectories.

Reports of Observers.

Many observers at target practice, and at other fir ings, have reported seeing projectiles in flight striking with their points following the trajectories. In no in-stance has any report been received of a projectile falling



No. 5.—Showing by impact of pro-on card, actual position during flight.

int up, as in sketch No. 2. Observers of m have reported that the axis of the projectile, both in the ascending branch and in the descending branch, follows

(To be continued.)

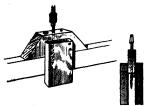
Leisehberg Tunnel Appreaching Completion.—The Loisebberg tunnel, which has been driven through the mountain on the right bank of the Rhone, suff which will form an outlet from the Simplon tunnel to the northward, is practically completed. The immed-carries a double-track rathread and is the discovering the table to the continuous control of the control of the control of the table tracks and the control of the control of the control of the table tracks and the control of the control of the control of the table that the control of the control of the control of the control of the table that the control of the control of the control of the control of the table that the control of the contro its full length, which is slightly over 9 miles, or 47,676

# Suggestions for the Workshop

### Ingenious Expedients of Resourceful Mechanics

### ng Domal-pin Holes By William Grötninger

T is often a difficult matter to bore straight dowel-pin holes in two pieces of wood, which are to fit to-sether squarely and tightly. The following description of a gags for the purpose should be readily understood: a piece of oak board, with two side

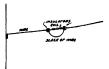


Gage for boring dowel-pin h

ed so as to form a socket in which the work fits and is held equarely. A number of different size holes are bored into the oak piece, so that bits of different sizes can be used, for large or small dowel-Mark the work with a pencil where the hole are to be bored, put the gage over the work, and put the bit in the holes of the desired size. Be sure to get the bit on the pencil mark, then bore the hole. If the gage happens to fit a little loosely, it can easily be made tight by wedging it with small wooden wedges.

### Reducing Noise of Telephone Wires By R. D. Mock

A WIRE, especially one with a long span, is some-times a noisy proposition when it is attached to the - actimes a noisy proposition when it is attached to the clapboards of a house. Every time the wind blows a little harder than usual there is such a moaning and greaning that elsep is well-nigh impossible. The wire seems to make a noise on the principle of the old-frainioned squawker boys used to make out of a tin can with a stort thread fastened to the bottom of it. Pulling the thread would produce a flendish noise. And every time the wind would make the wire give a pull on the house, it would sound like that old tin can.
my case, the telephone wires were the offenders.



eer for telephone wires.

e next time a lineman was in the neighborhood I got him to give me about a foot of slack on each line. Two very stiff coil aprings and two pairs of porcelain insulators then did the work. Each wire was wrapped insulators then did the work. Each wire was wrapped around two of the insulators in the regular way and then a spring was inserted between the two, as may be seen in the diagram. The spring was stiff enough to in the same manner. The spring was stiff enough to draw the wire up to nearly its usual tauthees, and yet it was elastic estough to take up all the jerks and unusual pulis that foreierly made so much noise. Fiverybody slept much better on blustery nights after this. Of course the main thing is to get a stiff enough spring so that the wind will not pall it out.

### A Chesp Pipe Wrench By H. C. Urbener

By H. G. Ilrheaser

Q UITE frequently it becomes necessary to have a
place wrench, especially for bress tubing, that will
not must the work and yet at the same time will pent
of using middest force to profince the required
results without trushing the tubing.
Fig. 1 shows one of the despect, simplest, and yet
most will be the profit of the profit of the penting, and yet
most will be the profit of the profit of the penting, and yet
most in the penting penting and about 15 / 14 × 18
unit a place of pineng phisch besther bailing about 5 feet
high this will must below the surface of the wood
with the penting penting the penting penting penting the penting pe

on the side opposite the strap side of the lever. The ose end of the strap should have holes punch intervals of one inch or so to make it adjustable to the work with the stud the opposite side of the bar. The strap should be turned down over the end of the en up and around the work and back along th ton of the lever and around the apposite end, where it istened to the stud on the under side of throwing the strap around the end of the lever than to fasten it at the end is to insure rather than to fasten it at the end is to haure a mexi-num amount of pull on the strap with a minimum strain where it is fastened to the stud. Use this de-vice like any other pipe wrench. To release the wrench for another pull, simply pull it away from the pipe far enough to allow it to loosen its grip and begin for the new pull by simply repeating the first operation. The end of the strap must not be taken from the stud after it is adjusted until the operation of turning the pipe

With the use of this wrench, an even strain is placed with the use of this wrenten, an even strain is piaced upon the tubing on its entire surface without any pos-sible danger of marring or crushing it. With a few trials the work can be done as quickly

as with an open pipe wrench.

The writer has employed this idea in many different ways, and finds it most helpful. When a fountain pen



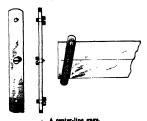
cap "sticks" take a little stick and a piece of dampened cord and in a moment it is loos

A few years ago the writer had occasion to unscrew the first joint of a 2-inch pipe in a tubular well in order to find the end of a broken wooden rod inside. As no large pipe wrench was at hand one was made as here described from a 4-foot piece of oak scantling and a strip of 1/16 × 2-inch hoop iron puriolized from a vinegar barrel. After setting the wrench two strong men pulled on the 4-foot lever with all their strength to start the pipe.

### Center-line Gage By Henry Klotz

THE accompanying sketch shows a handy little tool which for want of a better name I call a centerline gage. It is very useful on many jobs, and is easily made as follows: A piece of iron or steel about 3/4 inch thick and 1 inch wide is drilled and tapped to receive three screws as shown in drawing. The point of the center screw can be hardened so as to wear better. but this is not essential, as it can easily be sharpened en dull and replaced in position

When it is desired to mark a center line on a niece wood or metal, place the gage over it and bring



the sides of the end screws so they will press against the sides of the object to be centered. Then by pressing on the gage and running it up and down the desired line is secured. I have found this little tool much evenient and accurate than the regular scratch

### Unscrewing Nipples from Pipe Fittings By G. H. Ander

WHILE doing some pipe fitting the other day, the writer needed some close nipples and was obliged to take apart and use old ones, stuck in tees and elbows, because there were no others to be had just



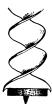
It was impossible to get the old nipples los with a wrench or in a vise without spoiling the thread a pipe-cap of the same size as the nipple was pro-

This can was cut in two with a backsaw. The two halves were placed on the nipple, after first having filed them flat on the sides, in order to prevent them from turning around in the vise, while unscrewing the nipple. This method proved to be very successful. The nipples came out without any injury whatsoever.

### Enlarging a Bore With an Auger By F. H. Jackson

THE following kink should prove useful for plumbers or gas-fitters When boring a hole through a joist for a pipe, the auger ran into a knot, throwing it a little out of line, so that the pipe when run through the hole would not screw into the fitting. The trouble was overcome by fitting a small circular piece of wood of same diameter as hole, on the spur of larger auger which made a guide, and the hole was easily enlarged

to a suitable size



Enlarging a bore.

### Shop Notes

Cuttlefish Paper. - Some years ago my attention was cuttenan raper.—some years ago my attention was called by a professional friend, a dentitat, to a paper which is sold by the dental supply houses under the name of "cuttlefish paper," and which is used by dentitat to polish gold fillings, it being for this purpose cut into narrow strips, passed between the teeth, and pulled back and forth over the filling The abrasive material on this paper (which comes in sheets about the size of ordinary sandpaper) is of such a degree of fineness, that it is difficult to tell which side of the paper is coated. The paper, which is apparently practically un-known except to dentists, has other very valuable applications. It is an ideal material for the rapid honing ors and of surgical and other instruments requiring a fine edge. Its cutting qualities are so rapid that a pocket-knife blade of ordinary degree of sharpness can, by giving it fifteen or twenty diagonal strokes on a of the cuttletish paper, laid flat, and followed by s slight stropping on a leather strop or shoe top, be brought, in the space of a couple of minutes, to such a degree of sharpness that it will remove the hair from aggree or sourpasses that it will remove the main room the back of the hand or arm as though it were a razor in fine condition. In houting razors, especially those that have a rounded edge and need houting hadly, it will produce results in one or two infinites that would re-quire a half hour or more on a stone hone. For this se the paper is drawn over a level wooden block, and turned over the ends and tacked or clamped in place; the razor is then laid perfectly flat, and given diagonal strokes in both directions, drawing away from Ten to twenty strokes in each direction will see eage. Len to twenty strokes in each direction will usually be sufficient. A moderate amount of stropping will remove the alight feather edge sometimes produced, and leave the razor in fine condition for shaving. So far as I know, the paper is obtainable only through dental supply houses—CLAURE L. WOOLEET. and the property of the party of the second to the second

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

### Automatic Control for Aeroplanes

N aeroplane maintains a constant level in the air Aby maintaining a constant speed through the air If the air is in motion, the matter is complicated by the fact that the winds never move with constant velocity The steadlest of winds is interrupted now and then by a lull, and sometimes a wind is made up of a succession of puffs. An aeroplane when moving in a variable wind, particularly when moving in the direction of the wind, must bob up or down, depending on its velocity with respect to that of the wind. Under these conditions it finds the same difficulty of keeping its equilibrium that one experiences when trying to walk on a shaking platform, such as found in our amusement parks. Conditions would be the same were amorement parise. Committees while the same were the machine flying in quiet air, while its engine was retarding and accelerating irregularly. The only cure for its staggering course in fickle winds is to compene for the retarding and accelerating of the wind by accelerating and retarding the engine to a corresponding degre

rule, aviators depend on hearing and touch to As a rule, aviators depend on hearing and touch to determine their speed through the air. But the best of pilots often find it difficult and impossible to ac-count for variations of speed experienced during a flight. The balance of an aerophane is so delicate that seem in still air, it often swerver from unsuspected were in still air, it often swerver from unsuspected more than our fifths of the Fued army states that more than our fifths of a revolune sectionia are du-tated in the still of the still are the still of the still of the lower of extreme of a said and the still of the still of the lower of extreme of a said and the still of the still of the lower of extreme of a said and the still of to loss or excess of speed, and he believes that it is essential to good flying that the pilot of an aeroplane be provided with an instrument which will show the speed of his machine over the air. He devised a simple rument of this sort, which is shown in Fig 2.

It consists of an aluminium plate A with a dial secto compare to a natural matter A with A that sector on which is a prominent red reference mark shown at B. The indicator needle C is secured in a block pivoted at D. Rising vertically from this block is a rod, on the upper end of which is a hollow sphere E; a bob F below the block serves as a counterbalance. while a spring G may be adjusted to hold the sphere E in vertical position, and the pointer C on the mark Bwhen the aeroplane is traveling at a certain pre-deter-mined speed. As the instrument moves through the air in the direction of the arrow, the wind pressure air in the direction of the arrow, the wind pressure on the sphere E causes the latter to swing on its axis D, and depress the pointer C, when the speed occeeds that for which the instrument has been adjusted. On the other hand, if the speed decreases, the spring G causes the polinter to rise above the mark B. This instrument is very sensitive and provides the pilot of the scroplane with an accurate gags of this speed

The extreme sensitiveness of the apparatus has given the hint to Capt. W. I. Chambers of the United States Navy to employ a speed indicator of this general char acter for the automatic control of the elevating rudder of the aeroplane Capt. Chambers' instrument is shown or the actorisms Capit Chambers instrument is shown in Fig. 1, which is partly broken away to show interior details. Like Capt. Etteve's speed indicator, it is provided with a dial sector B, and a pointer U, connected to a sphere E, which projects in the path of the wind At each side of the safety mark B are arms J bearing contact buttons with which the pointer C is adapted to come into contact when the speed of the seroplane exceeds or falls below the safety limit. The electric exceeds or main otion the salrety main. The execute circuit is thus closed to elevate or depress the hori zontal rudder of the aeroplane. The arms may quickly be adjusted by the pilot while in flight to suit any

Mounted on the rod which bears the sphere E is the crosshead, from which are suspended upon a pair of very flexible spring bands I, weights K, that are adjustable on stems. The spring G pulls the rod on which the sphere is mounted and its tension is regulated by means of the screw L. A variety of adjustments are thus provided, first, the sphere E; second, the spring G; third, the crosshead  $H_i$  fourth, the springs I; and fifth, the weights K. Thus ample flexibility is assured for the power and the sensitiveness of the pressure sphere and for the power and the sensitiveness of the accelerance. ating action of the weights K, which operate above the axis D.

In a separate compartment of the instrument there is an electric lamp M, in front of which is a slotted is an electric lamp M, in front of which is a slotted orginder N, which may be turned so as to allow the light to pass through the slot and illuminate the dial sector. This illumination may be made as bright or as dim as desired by resulting the cylinder. Above the instrument a 2-luch baroneter O may be mounted, receiving its light through a slit as indicated at P,

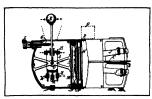


Fig. 1.-Combined spec cator and automatic

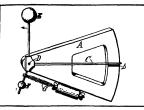
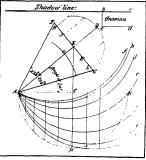
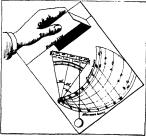


Fig. 2.-Speed indicator for aerople

the light being reflected to the barometer dial from a small semi-circular reflector above its face Thus we have, combined with a fextile automatic stabilizing de-vice of light weight, an effective speed indicator, which is always adjustable to suit the conditions of flight and is always available for use in event of motor derangement



Construction of the dial face.



Method of using the pocket sun-dial.

### A Pocket Sun-dial By Dr. Leonard Keese Hirsh

A NOVEL form of sun-dial has recently been devised by Mr. F. N. Lovegrove of London, England. Not only does this dial give the hour, but by it may be found the time of sunrise and sunset in any part of the country, also the sun's declination and the date of its entry into any constellation of the Zodiac. The sun-dial consists of a sheet of cardboard in the upper end of which a piece is cut out, so that it may be bent up to form a gnomon. When the shadow cast by the gnomon falls on a shadow line drawn on the cardboard,

gnomen raise on a smalow line drawn on the carposare, the time is determined by the position of a bead on a plummet line. The plummet line is adjustable in a slot to allow for variations in the declination of the sun at different dates throughout the year. The dial may be laid out as follows:

Draw first a shadow line near the upper edge of the cardboard, and near the middle of the cardboard draw the line AB parallel to the shadow line. Draw a line at right angles to AB, intersecting it at C. Extend this line to intersect the line AD at the point E, the line AD forming an angle with the line AB could to the latitude in which the sundful is to be used. For instance, in New York, which is at latitude 40 degrees, the line AD would form an angle of 40 degrees with the the hie AD would folk an angle of to degrees with the line AB. Through the point E draw the line FG at right angles to AB, and the lines AF and AG forming angles of 23½ degrees with the line AD. With E as the center, describe the semi-circle FDG. Divide the are into six equal parts and drop perpendiculars to the line FG. From the point F as the center with a radius equal to AF, draw the arc Af, and from the point Hcountry as the center with a radius equal to HA, draw the arc Ah and so on. Upon these arcs are drawn the hour lines, which are obtained in the following way: From C as a center with a radius equal to AC, draw the semi-circle AMN; divide this curve along the circ the semi-circle AMN; divide this curve along the cir-cumference into twelve equal parts, and from the points of division thus found, drop perpendiculars to the line AB. The hour lines may then be unmbered as shown in the drawing. Mark the line Af with the sum of Capricorums, and the line Ab with the signs of Aquarius and Sagitarius, the line Af with the signs of Aquarius and Sagitarius, the line Af with the signs of Pisces and Scorpio, and so on with the rest of the arcs. The zodiacal signs may be found in any

The date line may now be laid out. An arc is drawn at O. This is calibrated in degrees of a circle. Then referring to an almanac for the declination of the sun at different times of the year, the line FG may be graduated to show the various positions of the sun graduated to show the various positions of the sun for different months. For instance, the sun's declina-tion on the first of August is 18 degrees north, and on the last of  $A_{\rm sugn}$  is 8 degrees and 41 minutes north. By extending lines from A through the corresponding degrees in the arc 0, the points where they intersect the line FG will mark the month of August on the date line. This space may then be sub-divided into thirty-line. This space may then be sub-divided into one parts if deelred to indicate the different days of the month. After the date line has been laid out, a silt is cut in the cardboard along the line FG. The gnomon is also laid out along the shadow line. The lines ab, bc, and cd are cut through, leaving the line ad uncut. On this line as a hinge, the tab of paper is bent up. A thread is now passed through the slit FG, and upon it a bead is fitted. A knot on the thread keeps it from slipping through the slit. The lower end of the thread is weighted with a small place of metal. The sun-dial may then be used as follows:

If the observation is to be made on July 15th, the

thread is moved in the site to the corresponding posi-tion on the date line, and then is stretched across the 12 o'clock point and the bead is moved up to cover this point. Then the data is held in the sun so that the shadow cast by the gnomon falls along the shadow line. shadow cast by the gromon falls along the shadow line. The bead will swing down along the arc Al, and will come to rest over the hour of the day at which the observation is taken. When the plummet line hange parallel to the line OM the bead will denote the hours of sunset and sunrise for that particular day. By stretching the plummet line across the point A, the declination of the sun for that particular date may be occunation of the sun for that particular date may be determined on the arc O. As in .ll sun-disials, allowance must be made for Greenwich time. The difference of longitude must be allowed for at the rate of form minutes for every degree, subtracting from sundual time to the cent and adding to it the west. For instance, when it is fire o'clock on the security-dith meridian, from which time in the centern section of

he United States is taken, the sun-disl Sve in New York, which is on the sev

### ark as a Bush By W. E. Woodward s, 1919, by Muse & Co.

THE average bush THE average business man has only the sequest notion of the value of a trademark. He does not realise that it is very aften the connecting link between the proten the connecting that converent the pro-cer and the ultimate consumer; that it is symbol of good will, a tangible asset with determinable money value; that it must chosen and applied not in a haphasard a syn way but with a due regard for its psychologi-oal affect upon the public. Nor does he realise the importance of complying with the statutory requirements which secure to him a property right in a trade-mark com-

him a property right in a trude-mark com-parable with the property right that an investor acquires by taking out a patent. The following is the fifth of a series of articles, written by a man who is at once a trade-mark, an advertising, and a busi-ness expert, a man who has a first hand knowledge of the value of trade-marks and knowledge of the value of trade-marks. ct methods of trade-mark exploits The series, which will be eventually published in book form, will include dis-oussions, written in business English, of the Federal trade-mark law, analyses of th ente for registrati good trade-mark, and trade-mark pro-

# Analysis of the Requirem Registration.—V.

tinued from page 108, August 8d, 1912.)

Many applicants for trade-mark regis tration seem to think that the mere misspelling of a descriptive word, or some fanciful device in lettering, will remove ranctul device in lettering, will remove the word from the descriptive class. This is a belief that has no basis in fact; for no matter how a word is spelled or let-tered, it is descriptive if it conveys information of a descriptive character.

For instance, the word "Bestok" was rejected as a misspelling of "Best Stock;" "Unid" as a misspelling of "Unexcelled;" "Unit" as a misspeling of "United united "Kidnes Kure" as a misspelling of "Kidney Cure;" and "Pitteburgh Pump," printed with hyphens between the letters—P-I-T-T-8-B-U-R-G-H P-U-M-P—was refused registration as being both descrip tive and geographical

The courts have held that the word 'Elastic," used to designate drawers having an elastic seam, is descriptive, but the same word is used in a fanciful sense and is valid as a trade-mark when applied otional bookoas

A manufacturer of hooks and eyes ap-A manuscurer of mooss and eyes sp-plied for registration of the phrase "Rust? Never!" as a trade-mark. Registration was refused, as the mark was held to be descriptive, indicating that the hooks and would never rust.

rary numbers are obviously regis trable as trade-marks, but the applicant must be prepared to establish his con-tention that the numbers are really arbitrary and meaningless. In certain trades trary and meaningless. In certain trades, numbers are used to designate grades of a product common to the trade, and, in that case, the grade numbers are descriptive by common usage. A plow manufacturer applied for registration of the symbols "A No. 1," in "No. 1" and "AX No. 1" as trade-marks for plows. It was thosw, upon examination, that these symare used by many plow makers to designate grades, and they were, there-fore, ordinary descriptive trade terms.

egistration was refused. The prohibition against trade-marks descriptive of the character or quality of the product applies with equal force to trade-marks descriptive of the container package. A flour manufacturer put up product in barrels of a distinctive or pack moter—white and dark staves alter-ng. He applied for registration of a mark consisting of a pictorial representa-tion of the striped barrel. This mark was considered descriptive, and registre-

se used in the phrase "A fusty package for fastidious folk." The Patent Office held that the word "Fusty," as used in the phrase, was merely a descriptive term —an adjective qualifying "package"—and

registration was accordingly refused. The word "Spearmint," being a dee tive word, was refused registration as a trade-mark for Wrigley's Spearmint chew ing gum, but the representation of a spear considered registrable.

was considered registration.

Various applicants have sought registration for trade-marks which, while they are meaningless to English-speaking people, are really descriptive terms taken pie, are really descriptive terms taken from foreign languages. Such words are not registrable, for the Patent Office makes no distinction between languages. The phrase "Lait de Violettes," meaning "Milk of Violets," was rejected for perfumery. "Elegancia," as a mark for perfumery. the Spanish equivalent of the English word "Elegant," was rejected as a mark word Lagany, was rejected as a mare for perfumery. A descriptive word in a language as little known as Esperanto is, nevertheless, unregistrable. "Saniga" means "Sanitary" in Esperanto, and it has been accordingly refused registration on the ground of being a descriptive

In considering the question of descripmarks, the difference between description and suggestion should not be over d. Suggestiveness is a highly desirable quality in a trade-mark, and many goes quanty in a trade-mark, and many excellent and legally valid marks are sug-gestive. The name "Hydegrade," a requ-tered trade-mark, applied to a wellknown fabric, is suggestive of high quality, but it is not descriptive. It is a coined word, composed of the elements "Hyde' (name of owner) and "Grade." Another xample of an excellent suggestive mark is

example of an excellent suggestive mark is "Rubdry" applied to towels. Pictorial marks are often highly sugges-tive without being descriptive. The Baker Chocolate gril, depicted in the act of serving a cup of cocoa, suggests daintin taste, beverage, quickness in serving, ss in serving, and mfunchment

The word "Ideal," used in ea with a fountain pen, is considered fanciful, and not descriptive. It would seem that a very fine distinction is made here, as this word is an ordinary descriptive word, com-monly used to express a state of perfection, as in the expression "An ideal day." It may be said, on the other hand, that nothing ever reaches an ideal condition, and, in that sense, the mark may be considered fanciful

Geographical names, like de terms, are the common property of all who use the language. No one manufactures can appropriate such a term for his own can appropriate such a certain for its own exclusive use as a trade-mark unless he uses it in an arbitrary or fanciful sense. The only exceptions to this principle are to be found in the case of manufacturers who have adopted geographical terms as their marks and have used them so long. without opposition or protest, th have acquired a common law right to their

Among the geographical marks rejected

Among the geographical marks rejected by the Patent Office are the following:
"Yale," applied to hosiery; "Clover-dale," for canned fruits and vegetables; dale," for canned fruits and vegetables;
"Red River Special," as a mark for agricultural implements; and "Aurora" on
shoes—the name "Aurora" being applied
to localities in at least twenty States of the

It would seem in the light of comme active two properties of the result of the result of the rate of t nificance to the average person. It calls up a mental image of the dawn. If this case, and some others like it, are considcase, and some others are it, are consur-ered valid precedents, every applicant for trade-mark registration must be prepared to submit his application to the stern criticism of the Post Office Directory, with its catalogue of fifty thousand or more g or a personan representative database of mirror thousand or more triped barrel. This mark manes, (it is interesting to observe that, in descriptive, and registrated as later case, the Patent Office allowed that registration of "Auvoros" as a trade-mark gardential on of the word "Fussy," d. Co., ex ports, 100 Official Gaussie, 684.)

"Tahasoo" was refused registration as a mark for a sauce on the ground that it is a geographical term, Tabasco being the name of a State in Mexico. "French" was re jected as a trade-mark for paint. On the other hand, "Celtic" has been registered as a trade-mark for tea. The word has reference to a race, of which the Irish are only one branch. It is not applied to any particular country or section of the

The map of the United States has be refused registration as a trade-mark for sugar. "American Lady" was refused registration on the ground that the word When American is geographical. geographical term, applied to merchandise, used in a fanciful or arbitrary sens that is, when it conveys no deception in regard to the origin of the merchandis ay be registered as a valid trade-mark.

"Dublin" is a valid trade-mark for soan. although the soap is made in America. the case concerning this mark it was shown the case concerning this mark it was shown that it is the practice of soap manufactur-ers to call their products "Lunerick," "Scotch," "Irish," etc., and that the buy-ing public is aware of the fanciful use of names and is not doccived thereby

"Vienna," applied to bread, is considered valid. No one expects bread made in Vienna to be sold in America, quently no one is deceived by this fanciful se of the word.

"Cribraltar is registered as a trademark for belting. It is true that Gibraltar
is a geographical name, but its suggestive
ness in regard to belting conveys the mental
picture of strength, rather than the idea of

The student of trade-mark conditions having learned how rigorously the Patent Office interprets the section of the law applying to the registration of geographical terms, will perhaps be puzzled by the number of trade -marks of this class which see to be valid and well-established.

explanation of that is that man geographical names, which could not have been protected ab origine as trade-marks, have acquired a secondary meaning by long and exclusive use by a particular manufacturer. Such marks fall protection of the common law. Such marks fall within the

Some of these common-law marks are registered under the ten years' clause Among well-known geographical trademarks may be mentioned "Bristol" applied to fishing-rods; "Kalamazoo" applied to fishing-rods; "Kalamazoo" ap-plied to stoves; "Manhattan," the name of a brand of shirts; and "Elgin," "Walt-ham" and "Illinois," the names of watches. (To be continued.)

### Notes for Inventors

A Cost and Suspended Trousers. ent No. 1.031.719 to G. A. Kurz of Zanes ville and H. C. Shonting of Columbus, O. discloses a coat with trouser legs supported from within the coat, and stradetachably secured to the upper ends of the trousers legs.

Preserving Oil Paintings by Nitroge Gas.—In patent No. 1,031,727 Karl Muss-beck of Munich, Germany, has a means for preserving oil paintings, provides a cas-ing for the painting having a glass plate to inclose the painting which casing is air tight and supplies a charge of nitrogen ga within the casing.

An Abrasive Bowl that Pares Vegetables An Abrasive Bowl that Fares Vegetables.

—This vegetable peeler patented to Henry Robinson of South Orange, N. J., No. (1831,735, includes a bowl-like receptacle which is rotated upon a vertical axis and has its since side walles provided with an abrading surface which when revolved or recent in contrast with the accessible of the provided with an abrading surface which when revolved or recent in contrast with the accessible of the provided with an abrading surface which when revolved or recent in contrast in the accessible of the provided with the provided or recent in the provided moved in contact with the vegetable oper ates to remove the skin therefrom.

Storing and Launching Lifeboats number of lifeboats are nested one in number of lifeboats are nested one in the other and carried from the ends of swinging davits by independent hoisting ropes and blocks so the lifeboat can be launched ssively from the same davits from they are suspended. The patent which they are suspended. The patent No. 1,033,480, was issued to Henry A. Sey mour of Washington, D. C.

A Novel Pneumatic Tire.—James P. Clare of Stratham, New Mampshire, has secured

a patent, No. 1,033,229, for an inflatable tire which comprehends two separate tubes combined to form the tire. The two separate tubes are united to form a tire dy and are so arranged and united that each separate tube will form a separate ompartment, and portions of the combined tubes will form a third compartment.

Making the Kettle Shut Off the Heat. Knud Valdemar Rotzov of Malmo, Sweden, has patented, No. 1,031,874, a device for controlling the heat by the steam from the liquid being boiled. In doing this he provides a cooking apparatus with a heating producing medium in the form of gas and a valve for regulating the supply of gas. The heat causes liquid to boil and the steam from the liquid being boiled by its condensation, operates upon the regulator for controlling the supply of gas.

A Novel Core for Elastic Tires -Wilham Barbour of Glasgow, Scotland, makes an elastic or resilient body as a filler for cushion tires and the like which comprises an inner member or body formed from the depilated hides of animals in a moist condition and an outer mumber inclosing said inner member and of waterproof material so it will conserve the moisture of the inner member, the depilated hides being wound under tension. Patent No. 1,031,671 has been issued to Mr Barbour for the invention.

A Bill to Authorize the War Department to Test Upon Ships a Device for Hoisting and Lowering Lifeboats at Sea.—Mr.
Peters has introduced in the House of Representatives a bill authorizing the Secretary of War to construct and test upon one or more army transports or other ships in the War Department, the device for hoisting and lowering lifeboats at sea devised by A. S. Eells of Boston, Mass., and to meet the expenses out of any money in the treasury not otherwise ap propriated.

A George Westinghouse Turbine.—In patent No. 1,031,757, George Westing-house of Pittsburgh, shows a re-entrant turbine which has a bladed rotor element with a fluid discharging device which is movable toward and from the rotor and a stop on the turbine stator is arranged to limit the movement of the fluid discharge device toward the rotor. In the same issue Mr. Westinghouse patents, No. 1,031,759, a vehicle supporting device in which preu a venues supporting device in which pneu-matic cylinders are pivotally supported in connecting yokes and are interposed be-tween the yokes and the axle of the vehicle forming stress transmitting devices.

Versatility of Women Inventors.- Women have not only patented cooking utensils and other household appliances, but many inventions along other lines have been made by them, as the records show that they have secured patents for cultivator attachments, baing presses, dump wagons vehicle brakes, barrel taps, window frame and sash, calendar clocks and electric clocks, watch makers calipers, numerous educational appliances, heating apparatus, gas making apparatus, electro gas making apparatus, encours incursos appliances, horseshoes, motors and wind mills, plumbing devices, railway appli-ances, theatrical apparatus and in numer-ous other mechanical fields.

### Legal Notes

Recent Adjudicated Patents.-Out of nine adjudicated patents reported in the Patent Office Gazette of July 9th, 1912, only one was held void. In the other eight cases, two patents were held valid and in-fringed and in five cases no infringement

A Door in an Interference Proceeding. In an interference case of Summers Clark involving priority of invention of a door arrangement for dump cars, in which the doors at the bottom of the ear roll open laterally of the car to discharge the load, the Court of Appeals of the District of Columbia in reversing the decision of the Commissioner of Patents, and awarding judgment to Summers, said it was con-strained to believe with the Examiner of Interferences and the Examiner in Chief that Clark is not an independent, original inventor of the subject-matter in question.

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# SCIENTIFIC AMERICAN

### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC

Electrical Devices.

TELRITHOR ATTACHEMENT — B. Ross, care of tieneral belivery, Cleveland, Ollo. The object here is to provide an attachment having an ear tube with employee and the whole are tube with camping monthers, which embrace the conical portion of a telephone receiver, to press the enables member monther of the conical portion of the services, to press the enables member monther of the conical portion of the services, the opening of the said bead.

### Of Interest to Farmers.

caver, acoust two opening on the many opening of the Market No. 176, Co. 21, Dyrmanayana, P.O. 176, Cornall, A. of Language and Control of the Market No. 176, Co. 21, Co. 21,

### Of General Interest.

Of General Interest.

MAFE DOOR—G (look, care of Dr R 8
Eiidott, Laona, Wis The inventor provides
means especially adapted for safes haring cirrular doors, for receiving explosives introduced
between the door and the safe, and through
the openings of the lock and bolt operating
means, and conducting the explosives away
from the door, there to be exploded, or otherwise disposed of

sprinkled with water

HENCH — H A WHERLER and C W.

WHERLER, Eddayville, Neb The principal object of the investion is to provide a convertible bacch adapted to a variety of uses, particularly the needs of ontecpathy and chiropractics, the construction and arrangement being such that the parts are movable relatively one to the other, whereby the outil is espaine of manifold application.

manifold application.

BAG HOLDER—L. A DYREMAN, Maryland,
Ouseo Vo. N. Y. This improved form of bag
holder is especially adapted for use on counters. An object of the invention is to provide
a holder while is adapted to contain a numher of pockets of varying sizes whereby bags
of varying capacities may be held in contenient position for use.

RECEPTACLE --- W J HAMILTON, care of ark Hotel, Franklin, Pu This invention re-Park Hotel, Franklin, Pa. This invention re-lates to receptacles, and more particularly to barrela, and the purpose is to provide one with a plurality of side members having flanges which are engaged by sleeves for hold-ing the side members together and against the heads which are disposed to crose in the side

members BRICK PAYEMENT—C. C PETTT. Green-ford, Ohio For the purpose of securing inter-locking of adjacent rows of bricks to prevent displacement, shifting or sagging of a pave ment at any one point over uneren or faulty foundation, use is made of interlocking rows of bricks. The bricks in successive rows break ing joint and each brick being provided at one adds with a tongue and the other with a



groove, both extending from one end of the brick to the other end thereof, and the tongues of the bricks in our row fitting into grooves of adjacent joint-breaking bricks in the next row, so that each brick in each row is sus-tained. The engraving pictures a perspective view of the pareness.

FILM CAMERA.—H. W HALES. Ridgewood, N. J. The main object here is to allow not only pictures of different sizes to be taken on the same roll of film at will, but to economise

on the cost of operation by securing more ex-posures from the same roll or film, or if the usual number, then of a greater length than originally intended.

Originally Intendeed.

RAPETY RECEPTACLE —W. WINKELMANS,
494 12th Mt. Brooklyn N Y Bottles containing milk or other merchandise may be deposited in this receptacle, so as to prevent
the latter from being tampered with by unscrupulous persons when the vender leaves



them outside of the buildings. This simple inexpensive and perfectly secure device is nor-mally maintained unlocked, but it may be sub-matically locked or placed in a receptive lock ing condition by the insertion therein of a full milk bottle or other merchandies. The accompanying illustration presents a vertical section of the receptacle showing it locked

### Hardware and Tools.

SOD TRIMMER.—N. NELSON, P. O Box 15, La Fayette, Ore. Among the purposes of this invention is to provide an implement for use in landscape gardening and particularly trim-ming lawn borders along concrete walks or the like which will be more efficient and cer-



SOD TRIMMER.

tain of operation than those usually employed, and that, too, with a minimum expenditure of power. The adjustment of the mold board is intended to accommodate operators of different heights, and this adjustment can be used to heights, and this adjustment can be used to help the second to be adjustment. The engraving gives a clear exposition of the trimmer in operative position. HORR COUPLING AND CLAMP APPLY. THIS IMPLIANTENT —WM TANKERSLEY. LE MINIMUM COUPLING AND CLAMP APPLY. THIS IMPLIANTENT —WM TANKERSLEY. LE MINIMUM COUPLING AND CLAMP APPLY APPLY AND CLAMP APPLY A



HOSE COUPLING AND CLAMP APPLYING IMPLEMENT.

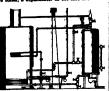
sizes of fittings and makes of clamps, which are provided with two rings for various means. A spud for holding the fittings with an ad-justable pin in gripping terminal, a slidable frame provided with a thumb screw for a clamping device, make it applicable to any

Heating and Lighting.

BURNER.-J O BROKEANS, Driftwood,
Pa. This invention provides a burner for
burning kerosen, coal oil, petroleum, gasoperati of consciently are a remarked to the burner of the provided to the peratification of the peratification of the provided to the peratification of the field in the burner and to prevent the scapes of obbasicon funce or odors into the reem where the burner is located.

where the burner is located.

OIL BURNING SYSTEM....F. J. KARSE,
420 Peavine St. Reno, Nevada For the purpose of this invention, use is made of a botler
connected with a source of water supply, and
with the steam generator arranged in the



OIL BURNING SYSTEM.

the said steam generator and connected with the steam compartment of the boiler and with the burner proper located in the shell adjacent the steam generator, the burner proper being connected with a source of oil supply. The likestration herewith represent self-tion of the system, parts being shown in

section.

STOWEPIPE RETAINER—W. H. Plansawre,
Green River. Unh. This improvement prevides a retainer to bold in operative position
a stovepipe section to grevent the same from
additing in the absorptic bole in the fine prevides a means for preventing the locasing of
the holding devices therefor; and provides an
charge makes to separate other and connectting sections of the pipe.

### Machines and Mechanical Bevices.

Machines and Mechanical Bertees, GRINDING MACHINE.—G. W. Hoander, Garden Grove, lows The principal object of this invention is to provide a new and im-proved grinding machine made up of parts which are one tranged that the grinding when when it is desired to sharpen the sickle of a newing machine, the construction and ar-



rangement of parts being such that the device may also be used for grinding chisels, axes, and the like. The device is also adapted to be held in such a position that it may be used as in the ordinary grinding wheel. The view pictures the device in use in grinding a movering machine stellar.

used as in the ordinary grinding wheel. The view pictures the device to use in grinding a moving machine stoke, as the property of the propert

### Prime Movers and Their Accountries

Prime Movers and Their Assessories.

GASDLANE PILTER.—?. CACCENCIA, Pagoas Borings. Colo The device is intended more particularly for use in consection with the gasolene islet of carbureters of gas engines. The inventors provide a water chamber below the gasolene chamber for receiving its arranged around the inner end of the general color of the provided provided the control of the control of the provided provided provided the control of the filter down its an adjustable grand which requires the communicating space between the gasolene and water chambers, and prevents spheading of the water on the filter. It is especially feduce with automobiles.

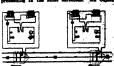
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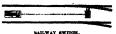
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Wats.—E. Desair, 12 Euc des Capacines,
Paris. France. This invention has Not its
object a signal indicating derice for gallways.

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is to provide a device by means of which two engines which are appreaching each other may be warned by means of signals to indicate safety appreach, when the means of signals to indicate safety appreaches the safety of the saf



secured to the rock shaft, one of the arms having means for operating the switch rail, and the other arm having means by which it is adapted to be operated by an adjustable member on a car. The accompanying illustra-tion pictures the invention in a plan view.

### rinining to Vehicles.

Periadizing to Vehicles.

VEHICLE WHERL.—V. RAFFEY, BOX 123, Bouth Bend, Wash. This invention relates to an improvement in wheal, and particularly constructed and an improvement in wheal, and particularly construction and arrangement of improved means which will present a wheel structure adapted to realisently give when the wheel in use.

WIND SHIELD FOR AUTOMOBILES.—W. A. FARRON, TWO, Ollo. This investor provides the provided of the provided provided and provided and

pendent of the axies.

VBHICLE WHEREL.—J. W. CALZA, Platta,
S. D. As object here is to provide a device
to take the place of a wheel provided with a
pacematic tire. This device has all of the
advantages of the pacematic sire, but is not
as costly as the latter. Further, the object
is to provide a wheel having a consined epring
and premantic action, which results in a wheel
having and match relians quality.

Norm.—Copies of any of these patents will be furnished by the Scrawsteric Absmican for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

The paper.

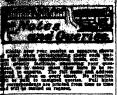
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Street, N. W., Washington, D. C.



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reginarring. The first volume covers with much therecaptaes all the elements, parts, and principles of the gasoniae motor—the media through which it works, the laws of gases, the cycles, the conversion of reoferousing into rostery mestion, the balancing of engines, and the offine and contract of the conversion of the contract of the

other American work on the subject.

CRIMA AND HARP PROPLED OF TO-DAY. An Account of the Customs, Characteristics, Annusements, History, and Advancement of the Chileans, and the Development and Recourses of Their Country, By Nevin O. Winter. Boston: L. C. Page & Co., 1912. 800.; 411 pp.; illustrated. Price, 83.

Page & Co., 1912. 8vo.; All pp.: Illustration. Tractod. Price, \$8.

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construction will wisdome it its a little treaties
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are built by this method, rective the processor of
water and steam curing, and concludes with
directions for making adevakis, and floors for
largel. Translated from the German by
Stella Bloch. London, New York, Torunto, and Melbourne Cassell & Co.,
Lido., 1911. Illustrated. 246 pp.
Astronovar you All. By Brune H Bitrgel. Translated from the German by
Stella Bloch. London, New York, Torunto, and Melbourne Cassell & Co.,
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Astronovar you All. By Brune H Bitrgel. Translated from the William
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eriol. J. Drako & Co., 1911. 12mo.; 790
pp.; illustrated. Prive, 82.
The purpose of the manual is to help all whose
duties cult them into relationship with the theory,
sedence, and art of telephony. After some preorder of the control of the control of the control
of induction, and of the application of principles
in the transmission of spoken words, the reader is
made families with the various electuies and systems, the battery equipments, magneto switchbearts and switchbosed installation, standard
in the chapter on "Telephone Troubles and How
to Find and Remody Them." the difficulties
most frequently encountered are cited, and all
possible causies are given. Line and conduit construction, wheless telephony, and automatic
exposition.

STARIJITY IN AVIATION. An Introduction
to Dynamucal Stability as Applied to the
Motions of Aeroplanes By G. H.
Bryan. New York: The Macmillian
Company. 192 pp. Trive, \$2.

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Hyan. New York: 'The Macmillan Company. 102 pp. Tries of 20 py some string more than 102 pp. Tries of 20 py some string more than 102 pp. Tries of 20 py some string more than 102 pp. Tries of 20 pp. 102 pp.

### The Cream Separator luded from page 118.

of Stockholm, Sweden, was one of the first inventors to confine himself to the development of the dairy separator His inventions included mainly improvements in gearing, bearings, and shape of bowl. The company which worked his inventions early attained considerable success in the commercial field. the ownership of the Houston and Thomp son patent, and De Laval improved on it and converted the raw idea into a practical machine. Ten years later, on the assignment to the company of the Bechtolsheim liner patents, the company se cured an almost absolute monopoly in th Manufacture of dairy separators.

Since the invention of the liner, prog ress has been steady and rapid. At first the makers were so flooded by orders creameries that they could not turn their attention to the improvement of the separator for other than creamery pur-poses. The hand separator involved a number of problems not found in the power separator, but they were problems for the machine designer rather than for

the inventor.

The hollow bowl separator is still in extensive use. For farm purposes, it pos-sesses some striking advantages over the liner machine Its case of operation and its few parts, making cleaning easy, commend it to many people. The modern hollow bowl is a long siender tube with a skimmer at the top. The liner separator, however, despite its defects, has the field. It is exclusive in the creameties. Of the meny form senarators on the American et, all but one are liner machine and the majority of these belong to the disk type, described in detail in the original liner patent. This consists of a numof dished steel plates spaced apart and secured to rotate with the bowl. milk is fed rapidly outward and is separbetween the disks. The central core is a hollow slotted tube which serves both to convey the milk and to support the liner plates. Besides the disk, there are a dozen or more other types of liners and these are susceptible of an infinite number of modifications, many of which are in actual use. Much serious study is being spent in working out the mechanical adjustment of the most efficient line possible Theoretical results are very dif ficult to demonstrate because even with perfectly transparent bowl and liner, it is of the currents on account of their ex-treme rapidity of movement. Much of the is being done by salaried experts in all of the larger factories, which have the equipment and funds necessary for carry ing on the work.

The three problems of most importance are the problem of properly feeding the milk into the bowl, the regulation of the skimmer, and the cleaning problem. With or without the liner, the milk forms a hollow column in the rotating bowl. richest cream is at the inner wall of the column, and the richness decreases toward the outer wall. Somewhere between center and circumference is the best point for applying the full milk. The direction of movement of the full milk on entering the bowl will manifestly have an effect on the efficiency of the machine skimmer, too, is susceptible of improve-ment. Usually some form of hollow screw on an eccentric axis is used. By turning the screw the richness of the cream can be regulated. At present, however, there is no satisfactory way of making the adjustment while the matchine is in motion The cleaning problem, while seeming to be simple, is in fact difficult and important. The bowl slush left in the separator con-tains much cheesy matter. This is difficult to remove with cold water and impossible with hot water. In the presence of water, hot or cold, it acts much like when the liner is a complicated one, the cleansing involves as much work as dish washing after a large meal. The alush is an excellent breeding place for undesirable germs, and unless the cleans ing is thorough, the next charge of milk Herita to become hadly thinted. This

usually means a money loss to the farme cameries grade their cream and pay for it accordingly. So serious is this trouble that separator cream is seldom equal in flavor to hand skimmed cream. The solution of this problem would be vorth a fortune. .

When the farmer has six or more cows and sells either cream or butter, the sep-arator pays handsome dividends on the investment. The saving in cream alone over the older methods will do this. The whole milk can be separated immediat after being drawn, instead of waiting from twelve to twenty hours. The farm separator has also an advantage over the creamery separator. Instead of daily trips, it means one or two trips a week, or better still the cream can be taken along when another errand takes the farmer to town. The skim milk, instead farmer to town. of being left at the creamery or coming back with possible contamination of disease germs from other herds, is fed to the stock while still warm, and in its be possible condition. The farm separator has come to stay because it is a money maker for the farmer, and properly handied, it should be an important factor in conserving the fertility of the soil.

One of the difficulties in the way of complete separation of milk is the affinity of the small particles of proteids and oil Prof. Babcock made of the fact that the proteids can be digested and dissolved in sulphuric acid, thus leaving all particles of butter fat free in a medium for which the particles have lit-tle or no affinity. He designed a com-pact and portable centrifuge, and test tubes so graduated that the proper pro portion of milk and sulphuric acid could be introduced. The percentage of butter fat is indicated on direct reading. The method, because it enables even the most unskilled worker to make reliable tests has superseded the old cumbersome laboratory methods, and is now in almost uni versal use in all countries where dairving

### The Motor Contest at Winnipeg (Concluded from page 115)

sonomy tost. This was taken advanta of by some competitors who held their en gines to as low a power output in the twoconsistent with economy, and then, with the fuel penalty removed. ran at the highest possible horse-power in the half-hour test. There were no points given on output of power in comparison with piston displacement, hence in one or two cases engines which had made very creditable showings from the practical standpoint, failed to get proper recogni-

In the plowing tests a field of 240 acre had been secured 12 miles from Winnipeg. and intermittent, happy-go-lucky train service enabled the competitors and visi-tors to reach the spot. The furrows were three fourths of a mile long, and each engine made a total of six miles, regardless of the number of plows pulled. This consumed from two and a half to three hours of actual plowing for each engine in addi-tion to stops and turns. The field was not as smooth and uniform as had been secured in previous contests, consequently the than the actual differences in the plows would account for. On the whole, the draft was much heavier than in any pro-vious contest, and it is interesting to compare the figures of close to 900 pounds pe pare the figures of close to 900 pounds per 14-meh plow, 31<sub>2</sub> mehes deep, with the ordinary figure of 400 to 500 pounds for the same plow twice as deep in Illinois and

Recording dynamometers gave the age draft very accurately, and an observer accompanied each outfit to get accurate data on the time, stops, condition of engine and any other points which had bearing on the performance of the outfit. Carefu measurements were taken of the fuel and water consumed in relation to the horse-power developed and the sares plowed. The score card was so arranged as to encourage the development of as high a hor power as possible, consistent with economy, but no maximum test on the drawhar was

neluded. The drawbar horse-power included. The drawnar name-power de-veloped, therefore, is probably nearer the economy load in most cases than the maxi-mum. This was illustrated by the larger Rumely tractor, which was used again in Rumely tractor, which was used again in the engine gang-plow competition. It developed only 34.4 tractive horse-power in the engine competition and 42 in the plow ~ competition, pulling a larger numb plows then b cause there was no penalty for fuel consumption. Points were give for the number of acres plowed per ho in comparison with the horse-power devel-oped in the economy brake test, and this as another element tending to keep the showing on the economy run down to as

low a horse-power as would still give eco-nomical results. Another factor which seemed hardly Another factor which seemes accorded, was the scoring of the engines on the distance traveled, or acres plowed, without replenishing fuel and water. The without replenishing fuel and water. scoring was done simply on the percentage of the tank capacity which was used, and did not consider that only in very few in stances could any tractor exhaust its sup ply of water before running bot. In the case of a steam tractor a certain amount of water must be retained in order to keep the crown sheet covered, and in the case practically every internal-combustion trac-tor, not more than 10 to 25 per cent of the total water capacity could be used without causing difficulty.

Following the engine competition was

rather elementary contest for engine gan plows. Instead of making short round which would require considerable turning and give the plowman a real opportuni te show up his gang, only one round was le show up his gang, only one round was plowed and that of the same length as in the engine competition. It was found afterward that a portion of the points in the score card would have to be omitted on this account. Five companies had entered plows, but only three competed. One withdrew early, and another at the last moment. after the decision to plow but one round had been announced. Avery Company won in the above classes with their self-lift plow, the Rumely plow being second, and the gang made by the J. I. Case Plow Works (not identified with the J. I. Case Threshing Machine Comnany) third

The competition drew the usual gallery of visitors of all classes, although the contest each year is becoming of greater interfarmer. One of the latter exclaimed, when he saw the engines working on the plowing "Why, that's just the same as we To the engineer, however, do at home. do at home. To the engineer, however, these contests afford a great opportunity to uncover his own hand for the sake of seeing what progress is being made by the competitors. The competition brings the most promunent men of this stamp together, and at least once a year the progress of the industry is thoroughly reviewed. There is no question that indirectly the There is no question that murrous was results have thus been of enormous value to the farmers of the world. There is a striking contrast between the easy cer-tainty with which the tractors and plows ow perform their task sense at the first few contes tasks, and

There is considerable agitation in favor of having a motor contest in the United States, but it is out of the question for the average manufacturer to spare his valuable men for more than one such occasion ın esch year. So long as Winnipeg, having the advantage, clings to her opportunity, just so long does it seem certain that one every year the eyes of the traction engine world will all be turned toward this magnificent city of the Northwest

### A Sahara Sas (Concluded from page 114.)

of fertility except moisture; also that there exist plentiful underground streams there exist plentiful underground streams and reservoirs. Now, if these crystal supplies were brought to the surface through hundreds of artesian wells and properly irrigated through the land, supplemented by artificial reservoirs to consciously the precious waters of the occasional aring ample resources the artesia the same area. serve the precious waters of the occasional rains, ample resources thus exist in the Sahara itself for bringing about future conditions of fertility such as have been

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erly arid regions of the

Boid. States. Meany athemos for indignating the Bahara two bean discussed. The old project, at hereached by the French engineer, of Boudake, and indered as entirely satisfe by De Lesseys and other compo-nt authorities, sees never been utterly at adds. To let in the waters of the editerranean to flood the most sunken rtions of the Algerian Sahara and thus nder fertile large tracts of otherwise ren sand" would not by any means ange the whole desert into a vast inland a, as so many people have imagined, ir in the least affect the climate of hrope, since only some 3,100 square tiles of territory, in the form of two disnot lakes in central and southern Algeria, would be drenched.

Prof. Etchegoyen, however, wishes to emstruct a deeper and longer canal so as to flood a much more extensive tract as to flood a much more extensive tract of desert. But it should be remembered that, since by far the greater part of the Sahars is from seventy feet to more than a mile in elevation above ocean level, and those tracts which lie below ocean and those tracts which lie below cocean level are chiefly valleys between the hills and mountains or the basins of ancient lakes never very extended in area, a Sahara Sea would consist only of an recedingly irregular body of wa taining many islands and extending into the unflooded districts in a multitude of bays and coves. It would be considerably less than one third the size of the Medi-The reported "one half" comewhat examerated.

Now arise the various questions of what Now arise the various questions or what important effects such a sea would pro-duce upon the earth. Without discussing further any political or economic influ-ences, there is still much to consider with respect to its possible physical influences. At last, in the progress of human achieve-ment, mankind fears the power of its own incensity.

The writer feels that this alarm be happily allayed, so far as a Sahara Sea is concerned. We are warned that "by the displacement of so many billions of tons of water, the equilibrium of the earth would actually be affected." Let us figure it out. Suppose the Sahara Sea should have an entire area of 250,000 square miles (thus allowing generously for any doubtful regions of desert that might become flooded) and a mean depth of Since one square mile contains 27,878,400 square feet, this entire area would contain 6,969,600,000,000 square feet and 1,393,920,000,000,000 cubic feet. Division of this sum by 40 (the number of cubic feet displaced by one ton)—the result is 34,848,000,000,000 tons of water required to flood the Sahara as suggested.

If the canal to admit this water were cut through the north coast of Africa, these thirty-five thousand billions of tons of water would flow in from the Mediterranean Sea, and at the same time the Atlantic waters would flow into the Medierranean until a level was again estab-ished. If the canal were out to the West African coast, water from the Atlan-tic would flow directly in, without visibly disturbing the Mediterranean. In eithe case, the process would be gradual; the flooding of the desert would not be a sudden, precipitous inundation.

Of course, 34,848,000,000,000 tons is a

great deal of water. But compare its volume. In that little curve of the Atlantic Ocean which forms the coastline of the New England States and New Bruns-wick and part of Nova Scotia, there is an area just about equal to this product of 300 by 500, or 200,000 squares miles—the same area since where the Sahars. Sea. There is a daily tidal rise in the Sahars and the same area since where the Sahars Sea. There is a daily tidal rise in the tantity of this play their models before the locality varying from about ten feet very men they are most desirence of reaching Cape Cod to sixty feet in some long at the American Road Congress, which parts of the Bay of Fundy. Allowing as in mean distribution of 20 feet rise, the number of toos of water therewar upon these shores twice every day in fully one shores twice every day in fully one locality are shores twice every day in fully one locality. Allowing as the shores twice every day in fully one locality in the leading highway engineers of the States, counties, and cities that this tidal displacement of water will are sent wort that they will participate form a Sahara Sea. No one ever fears in the congress, and many of the States that this tidal displacement of water will are making arrangements to have special "upbrishmen" the earth, or in the language booths at which full information and be of seasons, distant by the obligativity of the joint and the development and the an area just about equal to the product of 500 by 500, or 250,000 square miles—the

is utterly infinitesimal. In proportion to the volume of the ocean it is as a drop out of a pailful. And it is proposed to spread out this slight burden of displaced we over a region nearly at the equator. erimenting little further reasoning, or experimenting with globes or balls, will show that, since the earth is not exactly spherical but is the earth is not exactly spherical but is somewhat thickened at the equator and flattened at the poles, to disturb her present axis of 23½ degrees inclination it would be necessary to apply additional weight at either one of the two poles. Additional weight spread out at the equator could not affect the balance of

We are also warned that the climate of we are also warned that the climate of Europe would be endangered. That is a more interesting, because more plausible, objection. At present there is very little rain over the desert region of North Africa. Scientists agree that this dryness is due not to the arrangement of neighboring mountain ranges but to various physical causes in the region itself. Per-haps the presence of so extended a body of water might produce rains. Certainly it would equalize the temperature so that there would be less intense heat by day and less intense chill by night; but com-parison with other regions bordering upon seas in the equatorial zone shows that it could not reduce the temperature of a count not reduce the temperature of a trappical climate to that of any merely temperate region not influenced—as Ber-muda is, for example—by warm winds or currents. That eliminates one of the assumed dangers. The warm climate of the British Isles is due to warm ocean currents which sweep their shores; it is most unlikely that drawing from the Atlantic Ocean the water required to form a Sahara Sea would deflect, to any serious degree, if at all, any of these great currents. That eliminates another danger The third and last danger that has un versal import consists in whether or not such a sea would too greatly cool the winds that blow from Africa across the Mediterranean to southern Europe. Para-graphs might be written in discussing this interesting point, in telling how the winds originate in this region, the direction and influence of the trade-winds, etc. But it is safe merely to predict that while colo-nists living upon the shores of the Sahara Sea would doubtless delight in any cool zephyra that might blow from its surface around their homes, there would be no appreciable change in the "Afric breezes" appreciable change in the Arra drozes that blow across the Mediterranean. Why, the Sahara Sea would be merely a big shallow pond, an unusually large irriga-tion reservoir, compared with the natural

seas and great lakes of the world!

It should be remembered that if France reclaims the desert, she will do so for her own benefit. For several years Algeris has been to France what Florida is to New England during the winter months— her mainstay for all kinds of early vege-tables. The green produce, leaving Algiers at noon, is unloaded at Marseille afternoon of the next day, starts on the afternoon of the next day, starts on the evening trains for Lyons and Paris, and within thirty-five to forty hours after leaving Africa is on sale in the Paris markets. It was this proximity that first attracted her attention to Africa. At the same time she is not likely to permit the carrying out of any scheme which could injure the climate of southern France and destroy the revenue of her noble

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The Government exhibit, according t an announcement just made by Hon. Lo gan Waller Page, director of the United States Office of Public Roads and active president of the American Road Congress will have a complete exhibit on the Mi lion Dollar Pier, which will contain models of all the various types of roads

The highway departments of all the States in the union will be represented at the Congress, and there will be a comparative analysis of the contract and force account system in road construction. Papers will also be read on the relation of the contractor to the public official.

The site chosen for the American Boas Congress, which marks the consolidation of the convention interests of the Ameri can Association for Highway Improve ment, with all its allied organizations; the American Automobile Association, with all its affiliated clubs and associations; and the National Association of Machinery and Material Manufacturers, will undoubt edly make a special appeal to the more than 100,000 officials employed through out the country in supervising construc tion or maintenance of public highways Many have written to the headquarters of the American Road Congress in the Colorado Building at Washington, to say that they intend to combine business with vacation by spending the week beginning September 30th at the sessions of the cou-

Automobile tours are being arrange by the American Automobile Association from all sections of the country, and many of the legislators and other officials of the various States intend to be present The principal addresses will be made by President Taft and Gov. Woodrow Wilson

Preserving Fresh Flowers
N order to keep cut flowers from with-In order to keep cut howers from what ering, the water which they lose by evaporation must be replaced. Hence the stems are placed in water, the absorption of which may be facilitated by cutting th end of the stem to a wedge shape and thus increasing the absorbent surface. The same effects are produced to a still greater degree by crushing with a ham mer an inch or more of the stem.

After a time the wound becomes covere with products of decomposition, due to the presence of bacteria, which impede the absorption of water, especially if the air of the room is warm and the section is not sharply cut. It then becomes neces-sary to cut off the diseased part of the stem in order to lay bare the mouths of the capillary vessels.

According to La Nature, the life of cut

lowers can be prolonged somewhat by abstituting distilled water for river water. Hot water also gives good results, especially with fleshy plants like hyaduth and narcissus. When the flowers, kept in rdinary water, begin to fade, the bot third of the stalk is immersed in very hot third of the stalk is immersed in very hot water. As the water cools the flower resume their natural degree of stiffness. Before they are replaced in fresh water the portion which has been immersed in hot water should be cut off. Various antispetics are sometimes add-ed to the water in which flowers are kept.

The addition of a few pieces of w coal retards putrefaction, but it is still necessary to change the water every five



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this are that spiced it is comed contributed to the state of the state amount that hovers can be kept at source a month in this way. In amother method like washings are omitted but the source water is changed daily. The solution is prepared, in quantity, by dissolving one ounce of white soap and one tanth ounce of common sait in one quart of water,

and adding a little pulverized borax.

Sugar is also recommended as a preservative. The best results are obtained by varies. The best results are obtained by dissolving in each quart of water about tive ounces of sugar for pinks, three onnous for roses and six ounces for chry-sinthemums. Good results have been obtained also with sodium carbonate (wash ing sods) and with ammoulum chloride (sal ammoriac). The last named salt, however, siters the delicate tints of some

In general, flowers which are to be kept long in water should be gathered early in the moraing and in the state of buds about to open, and the stems should be immersed for two thirds of their length. is order to retard evaporation, the re in which the flowers are kept should be heated and ventilated as little as possible.

Evaporation can be prevented by covere petals with a varnish made by dissolving 20 parts by weight of light copal. solving 20 parts of weight of again copin-previously mixed with an equal weight of fine and or pulverised glass, in 500 parts of ether. The flowers are dipped in this solution four or five times at intervals of ten minutes in order to allow the ether to evaporate. Flowers treated in this manner retain their freshness and

eauty for a long time. Finally, the following method is generally recommended for preserving flowers and roses in particular, for long periods. A tin box is partly filled with very fine and perfectly dry salt (dried over a fire if necessary). The buds are laid on the other, and the box is filled with salt and orace, and the nox is nice with, sair and hermetically closed. If the dried buds are taken from the sait at any time within several months, and their stems are cut and placed in water, they gradually resume their original freshness and open A glass-stoppered jur filled with alter-

nate layers of violets and salt, and kent at a moderate temperature, may be em-ployed to perfume a room at any time many months, if not opened too fre-

### The Current Supplement

THE SUPPLEMENT, No. 1910, brings a number of good articles this week. a member of good articles this week. Fred. Diss.-Oss., of the l'niversity of Chiti, is peculiarly qualified to speak to us on the marufacture of Chill Saitpeter.
—The description of a rejently installed naneum devotté to animal life under frameum devotté to animal life under production de l'accommendation of the control of t ers.-Dr. Steinmetz, famous for his work in electricity, addresses us this time on a question relating to another field of a question relating to another need or physics, and makes some very interesting reflections on the second law of thermo-dynamics.—The center-page article is de-voted to the remarkable operations in voted to the remarkable observations in demanding the Mississippi for power pur-poses.— Our metallurgical beaders will be interested in an article on the relations of iron, vanadium and outrois in sizes,— Ad-description is given out the low tempera-ture laboratory at Leyden, in which Pro-Kaimerting Onnes carried on some of his

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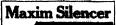


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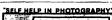
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For Fall Shooting







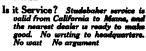


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### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

AUTHE CAR I

NEW YORK, AUGUST 17, 1912

PRICE 18 CENTS

### A Battleship With Cruiser Speed The Twelve-gun "Wyoming" Makes Over Twenty-two

MPROVEMENT in the motive power of ships, and e of large size and power, has been as great in the boiler room as in the engine room—a fact which is too often overlooked. Not all the great increase which has taken place in the speed of warships during the past few years is to be attributed to the engines. The turbine, it is true, has done much, but superheated steam and the water-tube boiler have had a large share in the improvement.

Take the case of that handsome battleship, the "Wy which recently, on its trial, made a speed of over twenty-two knots on one of its runs and an average speed of 21.328 knots for the four-hour run. The ship is driven by Parsons turbines, working on four propellers, and in the tests they gave the usual good results which we have come to expect from this wery fine turbine. On the other hand, 120-would be simply impossible to supply the necessary amount of steam for the turbines from a battery of the old Scotch boilers. They would be too cumbersome and heavy, and space for a sufficient installation of them could not has space for a sufficient institution of them could not be found in the "Wyoming" without sacrificing some other necessary element in the ship. The boiler equip-ment consists of twelve B. and W. water-tube boilers, equipped with superheaters and all the latest requirements of up-to-date boiler practice. The total grate surface 4s 1.44s square feet, and the total heating surface is 64.234 square feet. The contract maximum horse-power, or in this case, "shaft" borse-power, is 28,000, which was exceeded.

It was only a comparatively few years ago that wenty-one to twenty-two knots was the standard speed for the cruiser. To-day, cruisers of from twenty-five to twenty-eight knots speed are becoming common, and battleships speeds are never less than twenty, and are

sometimes as high as twenty-three knots.

The "Wyoming" is an enlarged "North Dakota;" and she embodies improvements which have been made as the results of the experience gained with that ship and her sister, the "Delaware," during the year or two that they have been in commission. The ship is five hundred and sixty-two feet in length over all, mietythree feet two and one half inches in beam, and i mean draft is twenty-eight feet six inches. T full-load displacement is twenty-seven thousand, two hundred and forty-three tons. The contract speed was 20.5 knots, which she has, therefore, exceeded by nearly

one knot. The displacement on trial was twenty-six thousand tons. The bunker capacity of the ship is 2,500 tons, but she also can carry four hundred tons of oil fuel.

The "Wyoming," and her sister, the "Arkans The "wyoming, and ner mater, or aranime, are the first battleships in our navy to mount tweive twelve-inch guns. The distribution of this batter; is similar to that on the "North Jacots," but with an additional turret. It is mounted in six turrets, all on the center line. Two of these turrets are on the fore-castle deck, and the other four are on the main

The arrangement of the turrets in three superposed pairs is symmetrical and adds greatly to the handsome appearance of these ships; in fact, we do not hesdiate to pronounce them the most shapely super-dreadnoughts which are now under construction for any mavy of the world

The twelve-inch guns are of the new fifty-caliber type—a most handsome piece of great power, accuracy, and rapidity of fire. When it is fired with its maximum velocity of twenty-nine hundred and fifty feet per second the energy is 52.483 foot-tons. Because of crosion difficulties, it is not likely that this velocity will be used in actual service. Probably the service charge will give about 2.750 feet per second. The secondary battery consists of twenty-one five-inch, fifty one caliber guns, so mounted that eleven guns are available on each broadside.

The armor plan shows a belt at the water line which is eleven inches at the top and nine inches at the bottom. Above this is another belt of armor fifteen feet deep and from ten to eight inches in thickness The turrets and barbettes carry ten to twelve inches

The United States Navy may, in the future, build more powerful ships, but it can hardly produce a more

### Preventive Clinics in Industrial Establishments

THE only way to interest the manufacturer in the health of his employees is to prove to him that it pays in dollars and cents to improve factory conditions. When his profits are obviously affected, he is likely to be interested in the welfare of his employees, as a general rule. Some of the larger corporations, however, have reached a stage where they regard the health of their employees as they do their own, not from a mer-cenary point of view, but simply as a matter of fair The whole matter is excellently considered by Dr. James A. Honelj in *The Engineering Magazine*, from which we quote the following paragraphs:

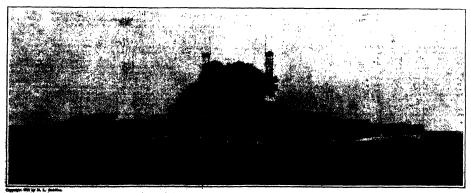
"Increased profit is represented by a more healthy, energetic attitude of the employee toward either his work or the purchasing public If ventilation, temperature, and humidity are improved, and if an existing physical disturbance is corrected, physical action as well as mental activity must necessarily be greater. In piece work this is apparent. When the market demand is large, and space is limited, it is imperative that the individual piece worker not only be relied upon to produce a certain number of articles, but often he is urged to increase it. Does the atmospheric and physical con-dition have anything to do with the profits of the em-

ployer? Most decidedly.
"In general, then, we can demonstrate the economic basis for a preventive clinic A case showing the importance of ventilation is cited by C. E. A Winshow where the New England Telephone and Telegraph Comwhere the New Engined reigning and Telegraph Com-pany at Cambridge, Massachusetts, had installed a sim-ple ventilating system in their operating room, in the spring of 1907. In Winslow states the following in his report on the Cash Value of Factory Ventilation:

his report on the Cush Value of Factory Ventilation':

The charge in writinities did not affect the attendance in the operation of the control of the contro

Another case is cited in which the cost of installing a ventilating system was \$0.000; the reduction of the percentage of absences due to illness was so great that the employer was compensated for his outlay; and while previously the employees were likely to become stupid in the latter part of the afternoon, the new system maintained aiertness during the entire day



en. Récum draft, 25 fees 6 hichen. Bhighlacoment, 26,000 tons. Full head displacement, 27,243 tons. Speed, 21.3 knots. Armanment; 25 51-caliber, 5-inch. Arman; helt 21 to 9 inches upper belt 10 to 5 inches; Surrets, 12'inches. Terpedose, two 21-inch, submerged.

# SCIENTIFIC AMERICAN

Founded 1845
NEW YORK, SATURDAY, AUGUST 17, 1912
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Munn & Co., Inc., 361 Broadway, New York The lalitor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are source, the articles short, and the facts outleartee, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this journal is to record accu-rately, simply, and interestingly, the world's progress in scientific knowledge and industrial

The Merchant Marine-Free Canal Fallacy HE United States Senate by vote of eleven to forty four has refused to strike from the Panama Canal bill the provision granting free passage through the canal to American ships. The correspondent of the Times at Washington is of the opinion that the overwhelming nature of the vote shows that there is no chance that further debate will change

the matter before the bill is finally disposed of This action of the Senate means that it is the delib-erate purpose of that body to violate the letter and, as many of us see it, the spirit of a most clearly-stated

treaty obligation But it is not of the moral aspect of this question that are about to write—we did that in our last issue at we wish now to point out is that in exchange for this playing fast and loose with international obli-gations we are about to obtain a very doubtful com-pensation. The country is asked to believe that the mission of tolls to American ships using the causi, will prove to be a powerful and very effective agency in building up our defunct merchant marine. As a matter of fact, it will do nothing of the kind. So far as constwise shipping is concerned, that is already protected; for the ships of foreign nations are prohib from engaging in such trade. To remit talks to coast-wise shipping will be in effect merely to divert a cer-tain portion of the profits of the causal from the Na-tional Treasury into that of the shipping companies

Equally short-sighted and fatuous is the belief that the remission of tolls will benefit our deep-sea ship-ping as a whole, and bring about a general revival of the American Merchant Marine The causes which underlie the present moribund condition of our over sea trade lie too deep to be reached by any such exsea trade in the deep to be reacted by any such ex-pedient as the remission of canal toils. The relief afforded would be too local and limited. Consider, for instance, our trade with South America. The remission of tolls to ships engaged in that trade would mean that those ships which run to South American ports on the west coast would receive the benefit of Government assistance, while those which run to ports on the castern coast would receive no benefit whatever On what practical grounds could such a discrimination Why should our trade to the western or justified? Way should our trade to the western coust of South America, to Australasia, and to the Orient be so greatly assisted, and the trade to South American and European ports be left in its present

queless condition? The upbuilding of our merchant marine is one of the most complicated and difficult problems that ever con-fronted the Federal Government—The question should be considered upon broad and statesmanlike lines, and stimulus that Congress may apply should s kind that will go to the very heart of the problem. The external application of a quack remedy (for such is this free-toll movement) will never do more than give a relief that is local and temporary. Our deepea shipping as a whole will remain in its present omatose condition.

The gain will be slight. The cost in low of interprestige and reputation for square dealing (and as a people we have always prided ourselves upon that) will be appaling!

We note that one of the amendments to the bill calls for the admission to American registry of foreign-built ships exclusively owned by Americans We are not prepared to admit that such admission would be altonother a benefit; but as a means to the end desired. it is infinitely preferable to the original bill.

If the Senate sincerely wishes to promote American if the Number successly with the state the same shipping, let it do something that is at least state-manife and consistent with that high standard of international morality which the citizens of this great republic still fondly believe to be one of our greatest national sweets.

Archeology, Sulphur, and Cyrene REAT industries have often been associated with the elements of physical danger confronting those who engage to further them. The ard is ten-fold increased when the operations are carried to, and even beyond, the frontiers of civiliza

tion. The history of every great enterprise of European tion. The instory of every great enterprise of Zupopani or American capitalization that has spread to remote lands and alien peoples, records death and suffering. To ascribe to the competition within the zone of civilization of two great industries the untimely de

of an American citizen not even remotely identified with those industries and laboring in archeological re-search on a bleak stretch of North African coast would be to presume upon the credulity of a reader of fiction. But an instance of the truth that is "stranger than fiction" is revealed by the train of circumstances that led to the murder at Cyrene, in Tripolitania, a year and a half ago, of Herbert Fletcher det'ou, of Michi-

In the columns of this issue of the Scientific American there is marshaled indisputable evidence to show that DeCou, who was a member of the expedition sent to Cyrennica by the Archeological Institute of America, met his fate indirectly as the result of the legitimate but none the less determined, rivalry between the centuries old sulphur industry of Sicily and the sulphur industry of Louisiana, youngest of America's "infant The evidence also goes far toward estab lishing the fact that the inordinate Sicilian fear and suspicion born of that industrial conflict was a contributory cause of the present war between Italy and

DeCou was plainly an innocent victim of circum stances that, for the most part, operated quite with-out his sphere of life, but that in an evil hour shifted only to center upon the desolate Acropolis of Cyrene, where he toiled with a scholar's rapt enthusiasm on behalf, not of industry, not of commerce, but of the science of antiquities. His lonely grave on the face of the plateau of Cyrene, "looking out westward, toward the homeland," to quote the description reported to the Archeological Institute of America by Prof. Richard Norton, of Harvard University, who directed the expedition, bears mute, but eloquent, testimony to the fact that the life-risk which attends the onward march of modern industry may, by an abortive sequence of events, find a sacrificial victim even in the pursuer of a totally divergent calling.

ow deep-seated was the antagonism which the ence of the American expedition at a point several hundred miles away from the coveted sulphur region of Gebel-el-Gebrit created in certain Italian quarters is to be gauged from Prof. Norton's report of the trialwhich beset the party in their efforts to obtain an actus start of operations on the site of Cyrene. The Senussi tribesmen whom they employed levied upon them for an exorbitant wage, and concerning this the director observed.

observed.

The reason why I agreed to this high rate (10 plasters or about 30 cents a day) was that I wished to convince the about 30 cents a day) was that I wished to convince the Araba, as soon as possible, of the advantage to be derived from our presence. (One reason that they demanded it was refused to work for us and foreome Presentation and the state of the refused to work for us and foreome Presentation and the state up by Italians, who would pay them one mighle (shout \$11) per day.

Of noteworthy interest, also, is Prof. Norton's statement that "homes to reason to summost the unliked were

ment that "there is reason to suppose the bullets were intended for the director, and that the purpose was to thwart the undertaking by driving the Americans for the country

The fact remains that the immediate cause of the DeCon tragedy was a criminal plot against American life and an American undertaking. Suspicion points to Sicilian influence in, if not direct Sicilian instigation to Stellan Inhuence II, it not direct stellan inaugation of the muffler. The current recital of the history of the Sicilian sulphur industry, which has always bean closely identified with the political life of the island principality, demonstrate how serious, how vital a menace American control of the sulphur deposits of ed to the stature of economic disaster before their affrighted gase. In the light, or rather the shadow, of so grave an impending extastrophe, their epergetic protests to Rome and the violent utterances cal press were justified.

of their local press were payments.

Had Cyrenates been under any civilised dominion, it would have been a relatively easy task for Raily's diplomatic representatives abroad to definitely ascertain whether, as the Bicilians feared, a concession for exploitation of sulphur in Cyremaics had

granted to the Americana.

granted to de ...

But the italian Government was selected from secret intrigue claused on the desired from secret intrigue claused and function of transity meeting interest of transity meeting interest of transity meeting interest of transity meeting in the secret interest of transity meeting in the secret interest of transity meeting in the secret of the contract of the contrac ake a fancied capital of the suspicion and of the Italians—to their great cost, as it has also proved. The war followed, and a fearful tell of Are life is avenging Turkey's deliberate secrifice of the

The Use of Ozone for Purifyles Ale OME very satisfactory results have of recent times been obtained by the use of ozone as a dis-infectant and decolorizer for impure air, such as to be reckoned with in crowded halls, in certain inhas to be reckoned with the crowded halfs, in certain lad-dustrial workshops and in other places. The use of comma-however, has its limitations, and in order to appears fully and instilligently apply this agent, it is messer-sary to understand those limitations. The subject is discussed in a pager by M. O. Tray, published in the General Electric Review. Experiments on the effect of ozone unon bacterial cultures have shown that the bacteria mear the surface of the culture may be more or less completely destroyed, while the despendent be the company destroys, while the state and the bacteria are affected but little or not at all. This is only what we should expect, for osone, coming in contact with the organic material of the culture meoxidires the same, and is at the same time reduced to ordinary oxygen. Thus there is no itself reduced to ordinary exygen. opportunity for any ozone to reach the bacteria in the deeper layers of the medium. As regards more particularly the action of osone upon impure air, it must be remembered that the ozone will not only attack bacteria and other bodies which it is intended to destroy, but will at the same time act upon all or-ganic matter present, some of which might have been gant matter present, some or which might have occur removed by other, chesper means, such as filtering. It is needless to point out that it is sheer waste to consume considerable quantities of come in the oxi-dation of such removable impurities, to say nothing of the fact that these may take up all the ozone supplied, giving it no opportunity to react satisfactority upon the substances for which it is particularly in-

As for the field of usefu ceas, it has already been pointed out that this extends particularly to crowded rooms and workshops. As special examples of the latter may be mentioned, the shops for assorting rags, factories for the manufac-ture of fertilizers, and those which work gelatine, give, hides, hair, fat, hones, horn and other slaughterhouse by-products. Such installations, the emanations from which constitute a nuisance and a menace to the public health, may with great profit apply the e treatment.

Several instances are on record in this country, in which the ozone treatment not only proved a very efficient remedy for conditions of bad air, but did so in circumstances in which other means had failed, or were for some reason inapplicable. Thus a moving picture show in Schenectady had experienced diffi-culties with its ventilation. The management were very desirous of providing the best ventilation possible, and had gone to considerable trouble in setting up the requisite equipment, but all to no avail. A larger blower could not be installed without giving rise to objectionable draughts. As a solution of the trouble an osonizer was installed, with the result that the air in the theater is now perfectly sweet and odorless, except for a faint and rather pleasant smell due to the small excess of ozone. Similar results were obtained in a workshop, the air of which was at times rendered uninhabitable by vapors arising from a solvent used in the process of manufacture. Not only was in this instance the desired relief obtained only was in this instance the desired relief covalines, but a costly system of draught pipes previously in-stalled could now be dispensed with. In another case a store was invaded by clouds of smoke from a fire in an adjacent building, and the owners saw before them the prospect of much loss owing to the difficulty of eliminating the odor of smoke from the rooms and from the goods. Here also, an ozonizer completely saved the situation.

the starilization of air, the ozone should be blown into the apartment, or the air should be drawn through a special chamber in which the ospne is mixed with it. It is important that the ospne gome freely into councer with each individual particle which it is desired to destroy.

The machine for producing the osone should

The machine for producing the come amoug noy produce any nitrous oxide or any other gas having an untoward action on the human organism.

The generation of comes should continue until the time, as determined by experimental test, is throughly sterilled, and the machine should produce this result without leading the airmonther with comes to six without leading the airmonther with comes to six of the continue of without leading the atmosphere with coose to an injurious concentration.

A STATE OF THE STA

The Shapels Walds in Copa. Statistics recently published which is the Copa. Statistics recently published when the throw is store than holding its an in Stanes. It seems that the throw that holding its an in Stanes. It seems that the brain anabor in that sittery for 1840 van 2,607,408, and that the had research in 1854 at 2,889,500. Although, as a means of mention, the highly self uncrive in Startope only to consider these book is, the casesor and western hemister it is a skinn a permanent position as a useful same of knowle, guestionized by or the artisan population. The new battle ships "Novada." "Oblighmen." which were recently illustrated in the property of the consideration of the new best extended about the property which have been decreased about 300 tons; with known adjustion. The advantages are many work officing well wealth the results of this new vocation weights have been decreased about 300 tons; with a few many and the control of the cont

Largest Sidewheel Passenger Steemer, Very Bleisting is the continual increase in the size of both cheight and passenger stammer which is noticeable on the Great Labor. The new stammely, "City of Detroit II," which is now in commission, is the largest identhest passenger steamship in the world to-day. In the history of steamship construction size has only been exceeded once, and that was by the "Great Eastern," which was 602 feet in length. The "Great Eastern," however, was both padels—and sover-propelled. This,"City of Detroit III" is 500 feet over all, 55 feet broad molded, 100 feet over the guards, and she has a molded depth at 22 (cet. We shall have more to say on this fine vessel at a later date. vessel at a later date.

The Cycle and the Diesel Engine.—According to the London Times, the Clyde shipbuilders have an objection against the Diesel eagine on the ground of its lack of flexibility as compared with the steam engine, claiming that it must be kept running at a fair speed obsiming that it must be kept running at a fafr speed ig it will stop allogsther, whereas the steam engine can the run either absed or astern at any slow speed desired. The makers of resignosating engines of the smaller marine type state that this is the principal reason why the oil motor is not making more headway. But a Diesel engine consumes less than half the amount of fuel and is in every respect far more comomical, and hence it is certain that the objection above assend et and fully mastered; indeed, the reduction gear would solve the problem at once.

German Naval Increase. -At the last annual meeting of the German Nava increase.—At the mas annual message of the German Navy League, under Admirál von Koster, the president in his opening speech, stated that the new navy law provided that by 1917 there would be in the navy forty-one battleships and twenty armored cruisers. Yet, in the face of these facts and of our recent emphatic reassertion of the Mource Doctrine, there is a determined attempt to prevent the con struction this year of our moderate naval programme of two battleships per annum. The people of the United States, we firmly believe, are thoroughly in favor of the moderate two-ship program. Taxpayers throughout the country should give their representatives in Congress to understand that the proposed coessation of building is extremely unpopular.

Vehicle and Pedestriau Traffic.—Any one who is abroad on the streets of lower New York at the noon hour-st any hour of the day, for that matter-must feel that the time is near when the question of profeet that the time is near want and question or pro-viding further foot-passenger ascommonation is very near at hand. We have frequently advocated the separation of pedestrian from vehicular traffic. The simplest way to do this would be to double-deek the streets, not necessarily across their full width, but by providing above each sidewalk additional sidewalks for

streets, not necessarily seroes their full width, but by providing "show cach sidewalk additional sidewalks for foot passingers at the level of the first floor. Apart from the locessing up of congection which would be sourced by this arrangement, the provision of sheltered didewalks at street level would be greatly appreciated, especially during the upiny weather.

First Veynes at the "Shelmedla,"—An imposition of the lineal segimes of the "Shelmedla" at the conduction of the lineal segimes of the "Shelmedla" at the conduction of the lineal segimes of the "Shelmedla" at the conduction of lar they issued voyage (of 23.494 inlies) shows thin they want. Brought the trial with, most attributory week larger of the section of the linear segments of the programme of file vaniel. The sistent rings and the cylinders were limited to be principled, and lepth the newlingsting and engineering officers spacing its line highest telephon to them of the conduction of t

### Electricity

eris. The extreme northeastern corner wire a seems.—In extreme northeasern owner of fibers will be in saliotelegraphic communication with Vladivostok by the end of the present summer. Stations are in course of erection at Mayahama and at Novo-Markovo, as the mouth of the Anadyr River.

Shocks from Pole Lines Exposed to Electric Waves.-That high power Hertaian waves emitted by modern wireless telegraph stations are capable of setting up high electromotive forces in metal structures in the immediate vicinity of the stations, was recently shown in Paris. Some workmen on a section of telegraph line experienced severe shocks when they touched the wires. Investigation showed that the source was the great Eiffel Tov wireless station

Ignition of Mine Gases by Electric Spark seldental explosions may be traced to the " ntal explosions may be trac seedential expiosions may be traced to the "touching off" of gases by electric sparks. A recent colliery explosion appears to have been caused by the tiny sparks at this remulber contact of an ordinary electric bell; the seedent emphasizing the need for providing absolutely sparks are electrical apparatus of all kinds in mines, forterion, or anywhere that explosive atmospheres are likely

Electrical Means of Destroying Marine Boring Werms.—A way has been found to check the ravages of the teredo in destroying wood structures such as the submerged piling of wharves by means of a special floatestric power plant connected to submerged elec-permanently wired to the wharf. Chlorine gas is ing el revues permanency wired to the wharf. Chlorine gas is electrolytically generated in the salt water, and the chlorine effectually cleans out the colony of teredos which are attacking the wood. An occasional treatment only is sufficient.

The Largest Single-phase Locometives.—The most overful single-unit electric locomotives that have been designed up to the present time are now being built for a Swiss railway. These locomotives, ten in number, weigh 108 tons each, total, and have a weight on their ten drivers (adhesive weight) of 85 tons. They are capable of developing 2,500 horse-power at a speed of fifty miles per hour, with a possible increase of speed to seventy-five miles par hour, for an uninterrupted run of 1½ hours, and can exert a drawbar pull of 18,000 kilogrammes from

Electrolysis Ordinance in Chicago. -The city council of Chicago has recently passed an ordinance requiring or Chicago has recently passed an ordinance requiring certain electrical equipment to prevent damage by electrolymis. It requires that the difference of potential between any two points on a return circuit must not exceed twelve volts and between any two points on the return a thousand feet apart, within one mile radius of the city half shall not exceed the limit of one volt, while between any two points on the return seven hundred feet apert, outside of this mile radius, it will not exceed the limit of one volt. Return current amporage on pipe and sable sh eaths must not be more than five tenths ampere per pound-foot for caulked cast iron pipe, and eight amp eres per pound-foot for screwed wrought iron pipe, and sixteen amperes per pound for standard lead or lead-alloy sheaths of cable.

Wireless Distress Calls Not to Go Unheard.the most noteworthy steps taken suring the Interna-tional Radio-Telegraphic Conference which opened in tional manno-resegraphic Conference when opened in London June 4th and closed July 5th is the laying down of a practical rule for attendance on the wireless appara-tus on shipboard. It will be recalled that the "Titanic's" distress signals went unheard by vessels in the immediate vicinity because the single operator employed on those ships was off duty at the time. Under the Confe rule, a permanent watch is required on ships of the first class, which means that two operators must be employed, and on ships of the second class, employing only one operator, the receiving apparatus must be attended dur-ing the first ten minutes of each hour. In order to allow the operator to have his rest unbroken when off duty, this provision will probably mean that one of the crew trained to receive the distress signal, will be required to listen during the ten minutes beginning each hour.

Fueled Pintinum in Quartz.—How to fuse platinum Fusing Fishman in Guertz.—How to fuse platinum wires into quarti tubes, so as to make a good joint, in no small problem. M. Berlemont presented his new method to the Asademie des Sciences not long since, and claims to have been successful. The difficulty is that quarts metts at as high a heat as ,800 deg. Cent. and hiss a very small expansion value, while all the metals empland to a much greater extent and also melt metals expland to a much greater extent and also melt at a lower temperature. After numerous attempts to make a joint, first by direct fusion, and then by an indirect method, such as the use of glass or enamel, acidisc or electrolytic deposits between the virte and the quarts, M. Berlimont came back to the first and the quarts, M. Berlimont came back to the first and the quarts, and paidnum-indiana alloy. By an improved process, requiring come sdiff, he could make a tight tased joint which would stand a high seat without damage, and was thus able to make all kinds of quartz tubes with fused elec-trodes.

### Aeronautics

Hydro-aeroplanes at Aix-les-Bains.—The municipality of Aix-les-Bains, one of the principle watering places in France, is engaged in organizing a concourse of hydro-aeroplanes with the aid of the Aero Club Flights will be made upon the Bourget Lake on this occasion, from September 14th to 20th, and there will be several prizes, amounting to a total of \$10,000. are to take place on this picturesque lake and the event will no doubt be an attractive one.

A Fiving Corns Bill.-The House of Representatives recently passed a bill authorizing the detail of thirty naval officers and thirty army officers for aviation duty at double their regular pay. Officers of the Marine Corps are included in the authorization to the Navy. The length of the detail is made four years, but it may be renewed. It is also stipulated that at any time an officer so detailed may be sent back to his regular duty if for some reason he should become unfitted for flying

A British Accopiane Gun.-Experiments with a quickfiring gun in an seroplane were made by the Royal Fly-ing Corps at Farnborough, on July 25th. The test was made in a stiff breeze at a height of about four hundred Some twenty rounds of ammunition were fired at imaginary objects on the plain directly beneath the acroplane. The recoil is said to have had but little effect upon the steadmess of the machine. A hiplane was used, built in the army factory. It was especially strengthened in order to carry the weight of the gun and ammunition.

The First Theft of an Aeroplane.-The first case of stealing an aeroplane occurred not long ago at the Puchem aerodrome at Mumch. When the pilot, Belat, arrived in the morning he found that some one had broken into his hangar and that the monoplane was missing On inquiry he found that several persons in the naighborhood had heard the noise of a motor about 2 o'clock in the morning. Apparently some enterpris-ing pilot had flown away with the machine. In the suburbs of Munich polocemen were kept biasy scanning the horizon in search of the flyer. Up to the present writing the machine had not been recovered.

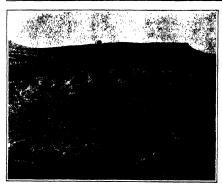
Statistics of French Balloon Ascensions .-- Figures show that the number of balloon ascensions in France during the first six months of this year is greater than ever before, this referring to spherical balloons. From January 1st to June 30th, there were made two hundred and fourteen ascensions, for which the amount of gas used was 243,000 cubic meters (7,300,000 cubic feet) The number of persons taking part in these ascensions was six hundred and thriteen, of which there are counted one hundred and twenty-eight officers appointed for the purpose by the War Department, also ninetyseven women aeronauts.

Proposed Aeroplane Flight from London to India.— The Peking-Paris aeroplane flight for which a prize has been offered by the Paris Matin has inspired English aviators with the project of arranging a flight from London to India, and a committee has been organized in London to push the scheme The proposed route is across Germany to Vienna, thence by way of the Shipka Pass and Adrianople to Constantinople; then along the route of the Anatolia Railway to Alepno: thence to Bagdad; thence along the shores of the Persian Gulf and the Arabian Sea to Karachi; a total distance of 4,500 miles. It is expected that at least three aviators will

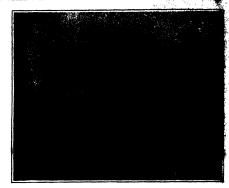
The Coming French Show .- The fourth international eronautic show which will be held at Paris in the Grand Palace is likely to outdo its predecessors in interest to the decoration, it is proposed to use the new aeroplanes which are being built by public subscription for the army. These will be hung in an attractive way so as to make quite an impression upon visitors. It is not cortain, however, whether this plan will be realized. As regards the exhibits, these are divided into thirteen As regards the extensions, measure united into intrient groups, comprising spherical balloons and airships, aeroplanes, motors and helices, scientific work and apparatus, works of art, material and machine tools, transport and shelter, maps and books, commerce, various industries and manufactured objects, motoroats, societies, touring.

Riplanes for Greece.-The fleet of huplanes which Bigianes for Greece.—The fleet of hiplanes which E. Farman's establishment delivered to the Greek Government not long since for military use is now engaged in very good flights in that country. More recently, Licut. Kamberos mounted on one of the hiplanes, which was transformed to a hydroplane, set out to make the over-sea flight from Athens to Hydra, the distance being about 50 miles. Starting from the port of Phalerov at 8 o clock in the morning, he saided port of Phaleros at 9 octook in the morning, he saised above the Salonque Gulf and hen rose to a great height and flew toward Hydra in spite of a very stormy wind. The torpedo boat "Nike" accompanied him. He alighted at the port of Hydra, after making the tra-in forty-three minutes at an average speed of fifty-five nalies an hour, and be flew back to Athens on the follow-

### SCIENTIFIC AMERICAN



Characteristic scene of sulphur operations at Caltanisetta, Sicily, showing crude product heaped in mounds, ready for shipment.



Molten sulphur pouring from melting furnace into melds at Caltanisetta; Sicilian mine worker "on the job."

# Sulphur at Home and Abróad

A Contrast Between American and Sicilian Methods

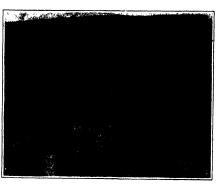
By Harry Chapin Plummer

S ICILY's sulphur production centers in the southerly angle of the Island and comprises an area about equal to that of the State of Connecticut. A population of 500,000 is directly dependent upon the industry, and of this at least 350,000 are ignorant, Ill-nourished peasants, called "carust," who labor in the mines.

The minable deposits extend from Centuripe, in the Province of Catania, on the

The minable deposits extend from Centuripe, in the Province of Catania, on the sast, to Gibellian (Province of Tanjani) on the west, and southward as far as the coast. The Tricher deposits, all under operation, occur within an area of from 60 to 106 miles in length, and from 53 to 56 miles in width. The sulphur, which in structure is massive, or coarsely crystallae, but usually compact, is found chiefy in an artifiaccous (linestone, associated with grysum and bituminous mar! The sulphur-bearing rock takes the form, not of extensive beds, but of immense lenses of variable thickness and richness, and there are usually present from three to four sulphur layers

Exceedingly crude and simple methods prevail, and have prevailed since the days of the Romans, in the mining of Sicilian sulphur—Steps hewn out of the rock lead



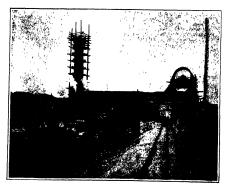
Mined lumps of sulphur at base of mounds, Caltanisetta, and

to tortions and disordered subterranean galieries attaining to depths of from 800 to 825 feet, but averaging about 600 feet. The crude ore is heated to the neitting point of 116 feet, Ceut., and collected as is run off Theres are two methods by which the sulphur is heated : one, by burning part of the mineral in what are locally termed colerons, or beeline ovens: the other by means of superheated steam forced into the deposits by hydraulic pressure, somewhat after the system in vogue at the American sulphur wells in

One of the most drastic moves in the history of the Italian Parliament was made necessary by a crisis that arose in Michigan Parliament was made necessary by a crisis that arose in Sicily in 1906. It was the passage of an act by which the 180 sulphup produces of the Island were forced to combine in a consortium, or state trust, and thereafter consortium of the consor

The Sicilian industry, debilitated by

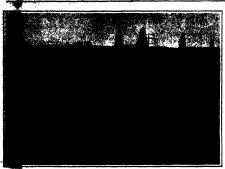
The same

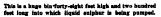


Mechanical operating plant of Jordan sulphur mine at Caltanisetta, with trackage and coke dump.



Molded cakes of refined sutphur cooling near emelter at Caltaninetta; atop of them two typical "carest," or boy miners.







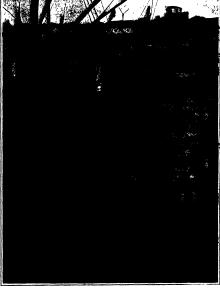
Loading a vessel with Louisiana sulphur at the rate of sixteen tons a minute. Contrast this with the method of loading Sicilian sulphur.

signification, usury and highly conductor, usury and highly conductor, late in the last century, editingured under the shock of news of the contag up of an immense deposit of submitter on the guiff constal plain of bestiffans.

By Herman Frasch's invention of a policess for liquefying sulphur in the ground, at a depth of 1,000 feet, and pumping it to the surface in fluid form. am immense alluvial deposit of sulphur in Calcasieu parish, Louisiana, on the Gulf consists on was opened up in 1883. The desposit was in the form of a volcanic cone, the apex of which was 800 feet from the surface. An eminent Italian engineer, Dr. Baldacci, delegated by his sugmeer, Dr. Baldacci, delegated by his Government to investigate the report of the discovery, that had quickly reached Europe, not only confirmed it, but extithe newly found store to aggregate #86,000,000 tons, or more than sufficient to meet the world's requirements for an en-tire generation. What most alarmed the Sicilians, however, was the fact, as re-ported by Dr. Baldacci, that the Louisiana sulphur was produced at an average cost sulpair was produced at an average cost of \$5.88 per ton, as against \$12 per ton, the cost of mining sulphur in Sicily Water, superheated to 350 deg Fahr, was sent into the ground in Louisiana, in col umns wherein a pressure of one hundred pounds per square inch was maintained. When dissolution was effected, the liquid when dissolution was errected, the induct sulphur was pumped into great blus of about 150 by 250 feet, where it solidified to the consistency of sandstone, and awaited the attack of workmen to break it up, by blasting, for shipment.

The wells were sunk in groups, the individual wells being placed fifty to one bundred feet spart, and a slugle well would be found to have a daily production of four hundred to five hundred feet of sulphur and to keep up a steady flow for months at a time. The liquid sulphur as it flowed from the well was so pure that the company was able to guarantee a sulphur content of \$250 per cent, but the company was able to guarantee a sulphur content of \$250 per cent, but the

average purity well exceeded that figure. Twenty 180 hourse-power boilers were used for a single well, and this represented experimentaticheou a ponderous scale. The number of boilers emisloyed to superheat the water used in the pumping law since been increased to 130, sach of 150 to 300 hourse-power, and arranged in, eight betteries, containing with one exceptions to 300 boilers excels, and each battery of boilers expedie of operating a well. Two of these batteries are placed in a group, so that one foreman can oversee both. The boilers are from wells located on the premises, and only three meet, two fremen and one water tender, are required on each battery. Similarly great economies have been effected in the dispatching of the sulphur for shipment. A fast car receives a load of thirty-dre tone within afteen minimals, while at the company?



Shipping sulphur at Catania, Sicily; antiquated methods of weighing and loading by hand labor, in baskets of straw, are shown.



Lecometive derrick in Louisiana taking up

docks at Sabline Pass, Tex., about lifty miles away, one man is embled to effect the automated discharge of an entire train load in a few minutes, unsessisted, and chartered stemmships and, of late years, vessels of the company's own freet have loaded more than ten tons per minute and sailed, laden with cargoes, of 7,000 tons each, within twenty-four hours after arrival at Sabline Pass. A striking contrast to the slow, inborious method of transforring the suiplur from the Siellian stores at Port Samphotels and Catania to waiting ships by hand, in buskets of but a few buskets certain.

but a rew numers each; Confronted by this studies development of a formidable competition in 1905, the Italian Government realized the seriousness of the situation It learned that the newly born subplur interest, youngest of America's "infant industries," had not only intrended itself in the markets of the United States and Canada, hitherto monopolized by the Stellian product, but that it had begun an aggressive campalago in the European field. It had even butte at Marsellies a great refinery for the treatment of the Louislana sulphar, brought to the French port in its own ships.

Premier Luzzati, who was then at the bein of Haiy's Ship of Strite, resolved upon a step which showed how criticalupon a step which showed how criticallle sought out the head of the American interest, Herman Frasch, the "wizzat" of the Louishna wells, who journeyed from Marsedlies to Rome upon the invitation of the great statesman. In the course of a memorable conferin the course of a memorable confer-

In the course of a memorable conference between the two, the Italian Prime Minister dwelt upon the economic significance of the plight in which the Sicilians found themselves.

Frasch piedged his company to restrict their operations on the continent of Europe to such consumers as they had already contracted with, provided that the Sicilians would abandon the American field.

The organization of the Consortium, or state trust, followed, with the resulting shut-down of 120 of the 484 mines. The employees of these, the smaller of the laind's inlines, were disbunded. But the attendant privation was minimized and the extreme results that the Government feared were obtained. Most of the labor earlier of the contract of the c

The production of Sicilian sulphur reached its high-water mark in 1905, with a total of 570,000 metric tous for that year, as against 330,000 tous in 1881 and 112,000 tous in 1800; but after the conclusion of the agreement between the Consortium and the Union Sulphur Company, the production diminished, and in 1900 totaled only 300,000 tous. At the beginning of the present century the production diminished and in 1900 totaled only 300,000 tous. At the beginning of the present century the productions of the production of the present century the productions of the production of the present century the productions of the production of the present century the productions of the production of

# Sugar Beet Industry of Germany

### What Science Has Done for a Great Industry

By H. C. Price

Fill beginning of the manufacture of Lugar from beets is a direct result of the Napoleonic wars in 1747 Margarf a German chemist discovered that the common white field best of Germany con tained sugar but this discovery was not considered as of any economic importance. But in the beginning of the mineteenth century when Napoleon Bonaparte was in the zenith of his power he put an embarge on the importation of sugar into Europe in order to strike a blow at Nap land since practically all of the sugar used in Europe came from the British col nies. This resulted in famine prices for sugar and now for the first time Margarfa fiscovery was thought to be of some economic value and that possibly the best might be utilized as a source of sugar. As a result in 1812 a factory the first of its kind in the world was built near Breslau Germany for the manufacture of sugar from beets in France like wise factories were soon built and under the attimulus of war prickes and govern ment protection the new industry was established.

Mince 1000 the average annual world's production of heet sugar has exceeded the annual production of cane sugar and in 1010 the world's production of beet sugar exceeded 8 500 000 tons or seventeen billion bounds

The development in so short a time of the sugar beet as a source of human food is not equaled by any other plant any where in history

### Increase of the Sugar Content of the

In 1812 when the first sugar was manu factured from beets it took twenty tons ractured from beets it took twenty tons of beets to produce one ton of sugar and at the present time it only requires about six tons. This decrease in the amount of beets required to produce one ton of sugar has been due to two things (1) more per feet methods of manufacture and (2) to a higher percentage content of sugar in the lect principally to the latter This increase of sugar content has been the result of scientific plant breeding and the results that have been attained in this line are the most remarkable and econ emically the most important that have ever been accomplished through the sci ence of plant breeding. Beginning with a plant that did not contain over 5 per cent of sugar systematic selection by the dant breeder has produced a strain that semetimes contains as high as 25 per cent of sugar and the average for an entire crop season in Germany has been as high as 17 per cent as was the case in 1910 that this immense increase in the sugar

that this limit his lincrease in the sugarcutant has been the development principally of the last few decades is shown by the following table giving the percentage of sugar found in beets that were produced under the most favorable Furopoliced under the most favorable Furo-

I 111) | Supar Contained in Beets

by Decades						
Year	Sugar	Year	Sugar			
1838	8 K /e	1879	117%			
1845	987	1888	117/			
1575	10.1	1898	15 29			
1585	10.1	1905	181%			

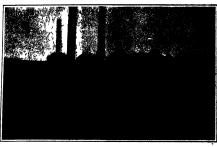
In America equally high percentages of sugar have been secured in some cases even higher

### Production of Beet Seed.

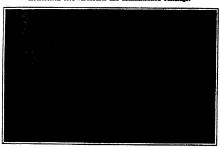
The sugar beet is especially well adapted to breeding slace a test can be made of the sugar content of the individual without destroying it for the production of seed. He beet is a blennial plant making its growth the first season and the following wear producing seed. In selecting beet is for sugar content they are barvested in the fall and in the labora.

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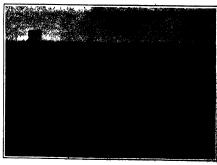
Germany is the home of the sugar beet industry. It has about 400 sugar factories with a total average annual production of over \$0,000,000 tons of sugar about one half of which is especied. Buyer boot sprucing is the most prefluible type of farming followed in Germany, and probably has done snot than anything (see to bring about the accollent type of intensite farming for which central Germany is a beginning that to provide the protect of heavy is in the hort of the super beet provide of Germany, and although it contains less than 10,000 square miles there are over 200 super factories in it. Good super beet land is worth \$200 per care, and the returns from sugar beet farming are large. This article is both a historical retriev and a summary of the technical methods that have circulated the super best industry to its present eminence.—Barrons.



The "plant" at Klein-Wanzleben, Germany, the largest beet breeding establishment in the world. The augar factory, laboratories, seed warehouses and administration buildings.



Beet breeding laboratory at Klein-Wanzieben, Germany, for testing individual beets for sugar content.



Women harvesting hoots. The type of laborers that are brought in from other provinces for the season.

tory a small section to benefit set, the best and tested for its super. This shows the sugar content of dividual best, and it is not labelled to the production of seed the best spring. In this sature solutions, made rom generation to generately pure strains and varieties eshably pure strains and varieties eshably pure strains and varieties eshably resultabled in France and Germany and the strain of the second section of the section of the

### Increase in Consumption of Suga

The world's consumption of segar 49 now eight times as much as it was fifty years ago. From being regarded as a luxury, sugar has come to be a necessity in the every day diet of predictally all of the common to the predictally all of which every individual seems to have a natural taste and it is more generally liked by children than any other substance. The amount consumed varies greatly in the different countries, and as a rule is in proportion to the degree of civilization and average wealth of the nation. England and the United States have been far in the leed in the per capital consumption, as shown below, and are the heaviest important.

Per Capita Consumption of Sugar in

Pounds Per Annum.	
England	89.5
United States	74.8
Switzerland	56 1
Denmark	56.7
Norway and Sweden	41 7
Holland	38.0
Austria-Hungary	37 2
Germany	36.9
France	36.0
Belgium	279
Russia	16.6
Spain	10.2
Turkey	8.2
Italy	77

There is no distinguishable difference between beet sugar and cone sugar as they appear on the market. They are entirely interchangeable, and the only determining factor in their use is the price at which they are sold. Although the production of cane sugar has increased rapidly, beet sugar production has advanced with a much greater rate of speed until now over one half the work's supply comes from beets. The increase in the world's production and the relative amount produced from sugar cane and from sugar beets during the last fifty years is shown in the following table.

World's Production of Cane and Beet Sugar in 1,000 Tone

Year 1860	Cane 1,376	Beet. 890	Total 1,766	Proportion Beet Sugar 22.1
1870	1,856	844	2,700	81.8
1880	2,084	1,581	3,615	42.4
1890	2,522	8,587	6,000	88.4
1900 .	2,978	5,440	8,418	64.6
1920.	6,286	6,471	14,707	57.6

The greatest drawback to the growing of sugar beets in America has been the inher problem. A large amount of hand labor is required, and in America this labor has not been available. In degenerally it is done largely by women. Advertisely, the course of 1000 these write the course of 1000 these was saive of the ownsers of the forms, and their families, and of this number 2,000, the course of the forms, and

(Constinued on page 252.)



### Correspondence

re are not responsible for a presponsiones column. Anonys money be electioned, but the new

### matypy and Spitzertypy

generatypy and Spitzertypy of the Schrift Armodan:

In with the acticle on "Sigmantypy," in Astronomy acticle on "Sigmantypy," in Astronomy for which a Gennera patent was issued in 1995 should be of interest. by the conduct of the sigman of

of Spitzer's process are remarkable for the th which details are rendered. A number y the process are shown in Photographische

y the process are shown in Photographicole for 1905, page 478.

berman patent is No. 161,911, patented bh, 1901; issued July 7th, 1905.

b, D. C. Brinsamin B. Schmerner.

### terer of Bow-on Collis

or of the Scientific American: ent editorial on the "Titanio" reminds me you what I wrote to the chairman of the Investigating Committee, but have not seen

n any newspaper.

a large ship, ilks "Titanic," moving swiftly. a large sub-nes the principal danger and the sub-ness large soberg, the principal danger and the sub-ness large would not be in the crumpling of the larger the flooding of several compartments, but in the larger the flooding of several compartments, but in the larger of the boilers and secondary to that the ba-

where of the engines.

When the forward motion of the ship is suddenly shiped nothing whatever could hold boilers and engines.

The treating loose and going forward and massing the theads and probably the bottoms.

But in addition to this the boilers must break the steam

This is submitted to your consideration, although it was a submitted to your consideration. n Jose, Cal.

[In his testimony at the Board of Trade Inquiry, ondon, the designer of the "Titanic" stated that if the ship had struck bows on, she would have crumpled up about 100 feet of her bow and would have taken several seconds to come to a state of rest. He stated further that the blow would have been so greatly cushioned that the machinery would not have been displaced.—Epyron.]

### A Word to the Socially Unfit

To the Editor of the Scientific American: Kindly allow me to say a few words suggest by your editorial entitled "Lunacy and Morals," your issue of July 18th.

your mene of July 185a. From the deterministic, the only thoroughly scientific standpoint, there is no "line separating responsible widedness from sots against the public poses which have their origin in perventice of the psychic apparatus." Both result from pseuliarites of structure, physical or psychical, which are often as much beyond the

solor result to produce the second of the second of the second of medicine or surgery as they are beyond the mesch of medicine or surgery as they are beyond the mesch of the subject himself.

Now that the old conception of punishment as social revenue has died out, in theory at least, the question is no longer whether one who is a public mensee is inance) or "immore." The point is that he is a diseased element in the social organism, and as such should be removed. Scientifically apacisate, he man who where the second of social conduct, as they are, by the the doctor of social conduct, as they are, see who does coverablemingly apainst the man who eventups the featured of decidal conduct, as they are, see who does coverable phose bounds reveals a weakness gither of judgment or of self-control, both of which are alide from the fact that the "impercursion of the moral sease." It either onegonital or the result of early influence.

The fault of the newer humanizatanism is not that it "now holds owners view as to breezponnibility for estimated note." but that it does not recognize that Ac feeders a man to be human does not make him less a cotal means and does not not take him less as cotal means are does it alore the fact that he has become what he is by the section of laws beyond his become what he is by the section of laws beyond his district. Method does it alore the fact that he hastly districted in the section of the se The fault of the newer humanitarianism is not that

er care of our idiots, lunation, and criminals than better care of our lidiots, lunatios, and criminals than we do of our children. The least are left to chance until they become lidiots, lunatios, or oriminals, when takey begin to receive the attention which comes too leate. A rasdonal and truly humanitarian policy would be to eliminate these elements by a painless death, which would ead many miseries, protect society, and purify the social atmosphere. Vast energies would thus be left free to attack the problem of social requestion at its root, the children. The social organism can areve know its own possibilities until it has given every child as comportunity to crow un under the best every child an opportunity to grow up under the best possible conditions, physical, educational, and ethical, and it is time that public collectude shifted more in this

Washington, D. C.

### A Manufacturer's Views of Patents

To the Editor of the Scineric American:
Noticing in the papers that when Mr. Samuel O.
Bemunds of New York city appeared before the Committee on Pasanta, he advocated making the date of filing the application on an invention the test of priority of the invention.

of the invention.

This might further the interest of justice in some rare cases, but I believe on the whole it would be a grievous mistake. It would result in the taking out of patents on thousands of unperfected, and conseatly useless inventions. The theory of our present is that unless the invention on a machine is somew is the law is that unless the invention on a machine is some-thing that will actually do the work intended, the peatent is invalid. The theory is that the specifications and drawings shall show enough, so that a man with ordinary mechanical skill in the line to which the patent pertains may be able to construct a useful and one

If the original inventor did not apply for a pate If the original inventor did not apply for a patent on his first reade conceptions when he began experi-menting, he would have to do overything under look and kay, and would always be in danger of having his conceptions patented by someone who found out what he was working on, so as to ber him from using it after he got it perfected.

it after he got it perfected.
It always takes a year, and usually two years, for me to make a material change in one of my machines.
The change I am now making I have worked on steadily for three years, assisted by a corps of expert mechanics, during which time I have built over twenty models in reducing it to a practical and useful state of per-fection. Under the present law I can do the work in the open, and have no fear of anyone stealing my

I have been through a number of interference pro-sedings, and while they are expensive and annoying, oscenage, and wante tarey are expensive and annoying.

I do not use any better way for insuring justice to all.

Semetimes I have grave doubts as to whether it is really very common to buy inventions for the purpose of suppressing them. It is true that concerns who have a large amount of money in vested in special machinery and plant for the manufacture of a particular article, would be loaks to make a change in that article which would involve a further large investment in tools and special machinery and the scrapping of a large portion of their original investment in this line. Perhaps a more serious destrement is the fact that a change always involves the necessity of re-educating the staff and working forces to the production of something entirely new, during which period an inferior product is turned out and perhaps the reputs alto of the firm seriously injured. Also oftentiones things which, after long and careful testing, and which, viewed from overy standpoint, appear to be practicult, when put on the market, for some reason prove to be inferior to the original device. This is contacting that can example vere be a large amount of money invested in special machinery device. This is something that can scarcely ever be determined with a certainty until after some months or years in the field.

The fact that nearly all manufactures of specialities, particularly those protected by patents, maintain expensive experimental departments, would tend to expensive experimental departments, would tend to expense the tendence of the control of th The fact that nearly all manufacturers of a This idea was tried out and disameded over twenty years ago and has since appeared in hundreds of adding and estimating machine patents. I have tried it out exheasitively on three separate consistence. Another was postented over investry years ago. I manufactured it for a time, and found it to be of more damage than headth. The seatment of the contractive to the contractive three from men who think they laive invented one or the other of those things, such that I am deporting the world or a great boom in reducing to turn over to them a factory and commitmation that has taken to brill the commitment of the contractive to brill the contractive to the contractive the contractive to the contractive to the contractive that has taken to trivial. organization that has taken twenty-five years to build up, for the purpose of perfecting and putting their inventions on the market.

It would be utterly futile to try to explain to them why their ideas are impractical, and if one attempted to do so he would have time for nothing else, besides he would not succeed in convincing them. There was he would not succeed in convincing them. There was newer yet suggested to me anything that I had not already considered and usually treed out exhaustively. I never bought any patent. Many a man has left my office with the statement that he was going after my scalp or that I would some day overlook a great opportunity by pursuing the ourse I do, only to some years after ask me to buy the mechancy which he had mercand the mercan section of the control to the mechanic section. had purchased for the purpose of perfecting the manufacture of his supposed invention. If I had originally purchase of his patent, he would always have believed that the purchase was only to suppress it. That class of inventor usually has little to do, so has time to make of niventor usually has little to do, so has time to make a good deal of noise, and a great many receive their statements at face value, honce the popular idea about buying up a patent to suppress it. Some manufacturers

ouying up a patent to suppress it. Some maintactures make a practice of buying up patents, but I do not believe that often they ever buy up anything of real merit for the purpose of suppressing it. The coat of selling a patented article usually acceed by far the cost of manufacturing. The public in its turn is very conservative, and as a rule all very meritone institutions. ious inventions have to be forced onto the public-their introduction involves a tremendous amount of educa-tion. I believe that it is in this respect that patents have been beneficial to the public--much more so than for by of our patent laws to encourage invention. If Congress should pass a law giving some firm the exclusive right to publish books treating of the method and use of the metric system and the exclusive right to make instruments for measuring and weighing by the metric system, in twenty years we would all be enjoying its benefits. As it is, no one can afford to jatroduce it, and Congress does not see fit to make

to jaticuses it, and congress uous accessed to a second to the suse compulsory. It has been said that the greatest boon conferred on Christendom was conferred by Gerbert when, after disguising himself as a Mohammedan, he succeeded in obtaining admission to the Moorish universities, and after passing through two of them, returned into Christian Europe, bringing with him Arabic numerals. No one had a patent on their use, and for several hunred one mad a patent on their use, and for several nur-dred years they were not universally adopted, and school children could not be taught multiplication and division except in the small factors, which could be computed by mental perception with the use of penil and paper. During that time, for business and engineernputations, everything was compute use of the abacus, such as is used by the Chinese and sians to-day.

No one can question the value to mankind of the potato. Numerous explorers brought back to France, England, and Spain samples of the potato shortly after the discovery of America, but it was several hundred years before it became a common article of food, in spite of numerous recommendations by various great authorities that it be generally cultivated.

I do not believe a patent should be issued for any long period of time. I believe that seventeen years is about right. For some things the period is too short to enable those exploiting it to overcome the inertia of the public and reap any material benefits from the long years of labor, but no law can be so formed as to fit every possible case. What appear to be the most revolutionary inventions should be partly accredited to the inventor who first makes them practical and partly to the general advance in the mechanical arts. Seldom if ever has a revolutionary invention been brought out that has not been conceived and an attempt made to put it in material form hundreds of times before, only to fail either because the inventor has not the ability to perfect it or else mechanical arts are not advanced to a point where it could be successfully and economically manufactured

Were it not for wars requiring the simultaneous manufacturing of large quantities of weapons, the sewing machine and the typewriter could never have been manufactured at a cost which would have made their purchase and use advisable. The machinery which has been evolved after many years for the manufacture of weapons had to be developed to a high point of efficiency before sewing machines and typowriters could be manufactured in large quantities and at a low cost. I can cite numerous other illustrations of

It is a serious question whether or not the one who pacers a new art or invention does the public such ploneers a new act or invention does the public such a great injustice, even when he buys other inventions in the same line. The expense of pioneering is or great, that unless he has reasonable assurance of a monopoly which will warrant him in incurring the enormous expense of pioneering, he cannot afford to take the risk. I believe that a careful analysis will demonstrate that in those lines where a patent monopoly is the most complete, the public has received the most bene-fits and enjoys the most advantages in the way of improvement in unality of manufactured product improvement in quality of manufactured product

Chicago, Ill.



THE reduing of petroleum oils as an art has been subject to a specular diversity of limitations. The infinite variety in physical characteristics of the crude oils which have been unearthed have imposed those limitations.

Crude oil may mean mything from an approach to submittent in character to the other extreme. An example representing the measterne which is a desired to the content of a little motion the content of a little motion of the content of a little motion of the content of a little motion of the content of the content of a little motion of the content of t

In the majority of Instances where petroleum is found, it is accompanied by more or loss extensive deposits of anturat gas. There are some exceptions in which petroleum is found alone. There are a great many cases in which gas is found not accompanied by petroleum, and many instances in which it cannot be shown that there is any physical connection between deposits of gas and oil

snown that here is any physical connection receives deposits of gas and oil.

It is an interesting but not greatly surprising fact that gases which are found residing with petroleum oils in the earth vary in physical characteristics aimost as widely as of the oils which form the great family of liquid petroleum deposits, this with reference to specific gravity and variance of the relative percentages of the different hydrocarbon compounds of which the gas is composed.

Trafti about two years ago natural gases were estimated commercially as methane. It is a fact that the freet volume of gas being produced and transported to large consuming centers may be so classed without great deviation from strict traft. Probably as much as 30 per cent by volume of the gas composition is methane, the remainder being ethane with very slight percentages in some cases of propane.

In dealing, however, with the gases which are found directly accommanting the performen oils as their resided in the statis from which they are obtained, we have a very different gade as a very different gade and a which different gade camposition of gas. It is thought, now, that the variance in gas composition in adjacent oil weble is much greater than is that of the oils. Weble located within a narrow radius and producing, so for as can be observed, oils of uniform character from the different wells will produce gases which vary very markedly in percentages of the different hydrocarbons of which they are composed.

Within the last two years, a development has been carried to the proportions of an industry allied to refining, but which becomes necessarily a part of oil field operations, and it consists in the recovery of a refused gasoline which is extracted from oil well gases at the

Like most new things "material pan question" is the product of an imagination. For years it had even material mostline collected in the pipel deep material products of the pipel material turned. This "deep" was bound up by refureing a manifest insertor, John Latropy Gry, made up his mind that he would find out why the "deep" even minded at III. He found that guarine collection with paterial twick comprehensively covers the material bulk paterial twick comprehensively covers the most most widely used. This article, settlem by one internally connected with the fadurity, esplains the scientific penniples of recovering gusoture from all until guars.

wells. There are a few exceptions to the statement that this product can be recovered from oil well gases only, but the writer believes that without exception it can be demonstrated that any gases which yield gason incondenses to any condensitie extent, communicate to and through oil producing strata. Since this phase of the petroleum industry has reached commercial proportions amounting to the recovery of probably some 2000 barries daily of a product which heetcofore had gone to waste, it would be interesting to look into the physical conditions which make it possible. It will be most convenient to deal with the series of hydrocurbons known as saturated parafins. It is possible that there and also be some exceptions to this latter

If we consider, however, that a triangle may graphicully represent the great family of saturated petroleum hydrocarbons, we can divide such a figure into percentages which may represent to the mind's eye, very clearly, the summary of facts involved.

We shall not permit the figure, or the percentages into which we divide it, to represent wholly relative volumes, but rather to represent combined volume and composition with reference to the structures forming the great group or family of percentages between

the great group or family of petroleum hydrocurbone. The dark base on which the triangic rests may represent the coke residue drawn from a petroleum still after the cruthe has been distilled into its various fractions; the second small percentage section of fractions; the second small percentage section (may represent percent greatly in volume, may represent greates and indictants; the fourth division may be made to represent lightling lots; the fifth, to represent anythina; the sixth, to represent amplituar; the sixth, to represent amplituar; the sixth, to represent amplituar; the sixth, to represent genoline fractions; the seventh, to represent genoline fractions; the seventh, to represent genoline fractions; the seventh, to represent genoline fractions; the seventh of the percent genoline fractions are percentaged and the percentage of the percen

great volume of gas product known as dry gas. The tenth and last division will be made to represent mechane portion, together with any impurities, of potroleum deposits, where gas and oil may be found in large volums. Nuch impurities as may be worthy of mention are carbon dioxide, free nitrogen, and some hydrosen subbidies.

a familiar conception of the chemical propo tion of the compounds forming the triangular graphic representation, we may go to its base and look for a composition which is almost wholly carbon. The next division of the triangle will represent a product baving a greater percentage of hydrogen and a lesser percentage of carbon in its make up, and when we have scrived at the third, or grease and lubricant division, we begin to find chemical compositions like C. H. of the saturated series having the general form Ca Has The sixth group will bring us to a chemical composition with which we are quite familiar, viz., C. H. gasoline, naphtha, benzine. The seventh group will still further lower the relative carbon proportion, and we will have a range of compounds running from  $C_s$   $H_u$  to  $C_s$   $H_s$ . The eighth division will represent our natural gas gasolines which are so closely related to the seventh group that it is not proper to designate them as different except as exceptions to this phase of the petrolem industry which we are considering now. The nint The ninth group or division is to play an important future part in our domestic life. It represents that very considerable fraction of the greater number of oil well gas which can be liquefied by reasonable treatment and delivered in strong steel containers to isolated consumers for fuel and lighting purposes. The tenth and final division is C II, with the above-mentioned impurities, which exist to varying degrees in different locali-ties, and are absent in the great majority of the important producing regions.

In setting a proper conception of this interesting matter, it must be borne in mind that the groups or divisions of petroleum products, unless subjected to extremely tedious treatment, are not sharply defined in chemical composition. This fact may be graphically represented again by the hypotennes side of the triancie, which might represent the graduation from a hydrocarbon structure through all the minute steps from as all-larebon to an all-hydrogen composition, the hydrogen point being represented by, the vortex of the triangie.

It is now easy to refer to and explain the method by which the product which is known as "natural gas agaoline' is recovered. For many years past in the operation of oil wells, where the gasse escaping from them have been turned into a system of pipe lines for service, and the running of ms engines used to pump the wells, difficulty has been experienced under favorable winner weather conditions in those lines becoming filled with a liquid. Some water is frequently present, but more frequently the liquid found in the type lines

### SCIENTIFIC AMERICAN

to be exactine. Many oil operations collect ble quantities during the winter season of this duct, which has been bought up by the refan interior grade of gasoline. It obtained on of inferiority from the fact that, in miny ag lain in rusty pipes and come in contact d dirty parafilm sediments, it has been disrequired filtering or redistillation. The has, therefore, been content to receive

The state of the s

rice for gasoline for gasoline for groduct, even though it be and of apparently high grade to refinery gasoline.

il laws involved in the proceiring gasoline from natural posedily very simple. They to be the same as for the of any liquid vapor susgaseous medium. The fact velops that the suspended at in natural gas being of different chemical groupings the matter somewhat and the requirement of more extensive the same secontaining a suspension is all that is needed the same be carried to a tent and effected under prophent for the separating of the precipitated.

Gets seck to about the year 1908, we shid, investigators going further into the war than the application of vacuum-to the year. In the application of vacuum-to the year, and the recovery of the "steps" from lines connecting the pumps said to produce vacuum on the wells. They were employing air compressors to consures the gas to an extent much beyond that for which oil well vacuum pamps are designed to do duty. John Leathrop Gray obtained, apparently, the salty patent which comprehensively covers the process, and the licensess under that patent seem to have found the most effective and extensive development of the in-

The essentials of this Gray patent are the compressing and cooling of the gases, the separation of liquid products and the accomplishment of the same by the simplest and most effective means.

Gray used a simple type of separator for collecting the condensates, and an automatic trap which continually transferred the condensate to a place of stor-

The advantageous features of the method are greater than are seen at the first france. One great difficulty in the development of the art has been to reduce the condensates to such a state of stability as will eliminate serious evaporation losses between points of production and consumption. It is now known that gasoline, either from petroleum oil or gas, will absorb considerable quantities of gas or even nir, and that the absorption is a function of time, temperature and pres-

Gray's method, therefore, of using traps to remove the condensates promptly, when precipitated, and minimizing the time of their exposure to gas under pressure, is of the utmost importance.

Just as in the case of crude petroleum oils, the new product, when produced by Gray's process, is capable of reducement to more homogeneous fractions. When to be handled as gasoline, the new product is very much improved by the removal of that portion embodied in a fraction which is too light and volatile to be stable at atmospheric pressure and the temperature opaditions which must be me in use.

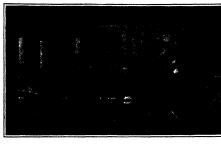
The recognition of new uses and in-

all five energy has held the presenters of the necessity of the new industry to a realisation of the necessity is providing means to effect the recovery and the apparation into commercial fractions of the total produced and the commercial fractions of the writer, and many fastalizations of machinery capable of ready adaption, to this method have been accomplished by the firm of, manufacturers which has given the industry its produced, until

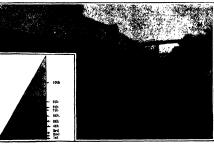
The possibility of separation by stage compression

treatment of a relatively large fraction of the product suitable for any fuel purpose, but which must be handled under restraint, brings about an entirely new phase of the petroleum industry which has not yet had scarcely more than an introduction to scientific and technical notice.

The successful introduction of the new product, which has been accepted as gasoline, depended largely on market conditions. It is comparable in inflammable



The squeezers—direct driven straight line gas compressors, using for fuel residue gas after gasoline has been extracted.



Receiving tanks, in which the gases from oil wells are collected.

The insert shows triangle representing the great petroleum family. Taking out the 8th group which represents the heavy portions condensible to gasoline, the remaining residues are 1st.—Petroleum Code 2nd —Petroleum Tax and War. 3rd —Greases and Lubricans 4th—Lighting Oile 5th —Naphtha, 6th—Casoline, 7th—Refning products, Pentane, Rinks 1eno, Cymnogane, 5th—Internation below gases. 10th—Mechanic 1st.—State 1st.—Stat



Air and water cooled coils used in the condensing system.

characteristics to the highest grade refinery gasolines, and since its bulk has reached considerable proportions, the transportation of the same has received the attention of the Bureau of Explosives, and finally the Interstate Commirces Commission with certain restrictive safeguards which have pinced its utilization at a premium, and the industry has been able to thrive only under the conditions of the consumers' demand which prevailed in 1910, and which now prevail. The whole year 1911 was one of plenty and predominant low

prices of all petroleum products. The refiners were able to offer their product in sections competition with the new natural gas condensates to the extent of largely shutting its recognition out from the consumer.

The new product finds its best adaptation in the treatment of the telliery low grade gasoline fractions to make them suitable for motor fuels. Apparents, the new product will be sufficiently plentiful to bring the entire petroleum naphtha fraction, which is too low in gravity for successful motor fuel

now in gravity for successful motor frict into a state of volatility making it entirely satisfactory, so far as carburetion and proper fuel mixture is concerned, and when so enlivemed, this particular impituh fraction has the greatest fuel value, having a greater weight for equal carbureting characteristics than any other known

The new product in appearance and physical characteristics is so nearly iden-tical with the refinery first fractions, when properly produced and treated, that it requires careful judgment to distinguish it. The gravities of the natural gas condensates range from 76 degrees to 100 degrees Baumé (sp. gr. 0.68 to 0.61). It mixes permanently and without stratification with any refinery product which is not technically termed an oil It also will mix sufficiently well with kerosene or li also will lighting oil fractions to make a good sat lighting oil fractions to make a good sail isfactory motor fuel, though, of course, such a mixture is not suitable for the cleaning of delicate fabrics where the presence of an oil would be objectionable. The term blending has been erroneously but conveniently adopted. The term itself would indicate the bringing together of two non-miscible materials. The light of two non-miscible materials on two non-misciple materials. The light condensate is perfectly miscible with any "dry" or naphtha fraction and cannot be separated or re-obtained except by fractional distillation, and then only imper feetly

The necessity for maintaining a cheap source of motor fuel will soon bring about the practice of "biending" the new "natural gasoline" or gas condensate with a 40 to 54 grativ lighting oil. Such a prodnet will not be recognized or given proper credit, however, until the price of motor fuels makes it necessary to resort to such a means.

The very remarkable increase in motor fuel consumption which goes on is destined, however, to bring about revolution and the adoption of any new thing which can safeguard the consumer against prohibitive fuel cost

For the question stands unanswered today, just as it has for forty years, have we reached our maximum crude oil production?

The advance in prices of the fuel fractions for this senson alone is sufficient to warn us for the coming consequences when we do reach the sentiti. We may assuwell assume that we are going to reach thoughts as to what actually can be done to thoughts as to what actually can be done to do not at all fully appreciate the import ance of our petroleum, not are any of we prepared to say what could be found to substitute it, were it no longer availables.

If we go back to the graphical triangular representation of perfordeum, which, being hurriedly drawn, makes no claim to precision, but can be counted upon to represent facts as roughly and about as closely as a quick conception could state them, we will see how great is the distinction of the properties of the proper

If we look at the combined sixth, seventh, and eighth groups, and consider them as adapted to gasoline motors, then consider the number and extent of these

consider the number and extent of these motors; and if we hold at the tenth divideo, representing natural gas, and consider that furfale, Eric, Clevland, Chehmatt, Pittsburgh, practically all the intersuing area and much surrounding, represents possibly one half the natural gas consumption; that all these communities depending on natural gas have reasonable expectation of many years of service, we get a good comparative idea of space after, which represents what is being wasted, what has always been wasted throughout the life of the crude of industry

# The Flight of Projectiles-II

### The Actual Positions of a Shell from Gun to Target

By Rear-Admiral N. C. Twining, U. S. N., Chief of the Bureau of Ordina

### Reproduction of Motions.

IN 1911 the Bureau of Ordnance of the Navy Depart-ment made a small model projectile and suspended it of 3,000 to 5,000 revolutions per minute (being about the speed of rotation of a large-caliber projectile). To simulate the air resistance in flight, a blast of air was directed against the rotating projectile, and the behavior of this projectile confirmed the theory in all respects. As soon as the blast of air was directed against the rotating proportile, the projectile began to precess about the direction of the air. As the blast of air was changed in direction to simulate the changing direction of the resistance m flight, the projectile's axis depressed to meet the new direction of the air blast.

A similar demonstration can be made with an ordinary gyroscope With care in manipulation the partial pre-cessions made by a projectile can be simulated.

### Penetration of Armer.

It is evident, even to the lay mind, that if projectiles struck with their axes not in the trajectory, penetration of armor would be almost impossible. This will be evident from an inspection of sketch No. 6.

evident from an inspection of seven No. o.

The forward part of the projectile would strike first,
but as the point of the projectile is not moving in the
direction of the trajector,, there would be a tremendously
powerful moment forcing the projectile broadside against the armor Practically no harm would be done to the armor, and the projectile, being forced at high velocity

The fact that armor has not more often been perced in naval hattles is used by those who believe the shell in naval natures is meanly income who control the size in does not strike point on as a proof that their theory is correct. They argue that if the projectile struck point on, the armor would be pierced

The small number of armor penetrations in naval

battles is due to a number of causes.

First. The armored part of a vessel is but a small part of the whole target, and, therefore, of the relatively part of the whole care, and, increase, of an relatively small number of hits that have been made against armor. Second, Frequently high explosive shells, with thin

Second. Frequently high explosive sites, with tuni-walls and sensitive fuses, have been used in naval-battles, and these projectiles on striking armor will break up or explode without penetrating, as such pro-jectiles are not designed for penetrating armor.

Third. Even with well-designed armor-piercing pro-jectiles complete penetration is not likely when the projectile but slightly overmatches the armor, unless the impact is not far from normal Projectiles striking armor at an angle of more than about 10 degrees from normal are subjected to severe cross-breaking stre as will be seen from sketch No. 7.

It is not expected that penetration will be secured under such conditions without the breaking up of the projectile, unless the projectile considerably overmatches the armor.

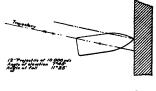
It is due mainly to the foregoing causes that armor enetrations have not been more frequent in naval battles To demonstrate, however, that penetration will occur at battle ranges, and to further demonstrate that the projectile does travel with its axis in the tra-jectory, the Bureau of Ordnance of the Navy Departjectory, the bureau of Ordinance of the Navy Department, in 1911, conducted a series of firings against modern 8-inch and 10-inch armor. Three hits were made at a range of 7,800 yards, one in an 8-inch plate, and two range or 7,000 yards, one in an 8-mon piace, and two in a 10-mol plate. All three projectiles penetrated the armor, leaving clean, round holes. The evidence was conclusive not only that the projectile traveled with its axis in the trajectory, but that modern armor could successfully be penetrated at battle ranges, and that the data obtained from short-range firings at the prov-ing grounds could be applied equally well to long-range

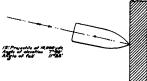
### Retardation of Velocity.

There is another proof that projectiles in flight must travel nearly point on. It is evident that the retarda-tion of the projectile, due to resistance of the air, must be much less when the projectile is moving point or than when it is moving considerably inclined to the than when it is moving considerably inclined to the trajectory, as in sketol No. 2. In the latter half of this trajectory (see first article) the area on which the arresponding to the area on which the arresponding to the trajectory that the velocity of the projectific toward the end of the range would fall off very rapidly. It is found from actual firing, however, that the retardation of velocity in the latter part of the trajectory is actually somewhat less than the retardation in the first part. This means, of course, that the projectile must travel practically point on throughout its flight. The ranges obtained from actual firings do not vary more than one or two per cent from the ranges calculated by assuming that the projectiles travel, throughout their flight, point first.

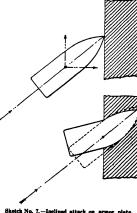
### Evalenation of Drift

It is found that all projectiles having right-handed twist drift to the right. This is exactly opposite to the drift or curve of a baseball, which with a right-handed twist drifts to the left. The explanation of the left-handed drift of the baseball is simple. The air,





Sketch No. 6.—The upper drawing shows the supposed and the lower drawing the actual position of projectile when it reaches the plate.



d attack on ar Plan view.



rotating with the baseball, in against the still hir to a gre-on the left side, and the res-against the baseball devision There is a similar effect open is very small, and the drift of pr

canses.
The rotating projectile is continually of tail precessions, the point of the project itself years sightly to the right of the tradestery. It is evident, thereby is a small component of the air resistant lates the projectile to the right. This is element in causing deviation in project justices with right-handed twist drifts to In addition, there is the effect of the frie which assists in moving the projectile tright.

If the axis of the projectile remains pa original direction, as in alcotch No. 2, it we oult, if not impossible, to assount for the projectile. If it is maintained that the mains parallel to its original direction, n mains parallel to its original direction, not tional forces could give the projectile devi-tional forces could give the projectile devi-these forces would descense with the rang quently, the rate of drift would fall off as increased. Exactly the reverse takes place projectiles, the drift increasing very rapidly crease of range. This increase of drift is o principally by the fact that the amplitude of consistent increases as the range increases: principally by the fact that the amplitude of their constant increases at the range increases; that is, point of the projectile deviates farther from the joictory. The resulting component of the air results which translates the projectile bodily to the right, therefore stronger, and as the velocity of the project is being continually lessened, the drift increases rap

As the angle of severation increases the axis of the pro-jectile must turn through larger and larger angles, and order to descend point first, and the greater part of this change of direction has to be made in traveling a rela-tively short distance near the top of the trajectory. This will be evident from an inspection of sketch No. 8.

Those who believe in sketch No. 2 would predict that Those who believe in sketch No. 2 would predict that all projectibes fred at high elevations would fall base first. Yet, all records and data show that these projectiles fall point first until angles of elevation of mose than 70 degrees are reached. If fired at elevations cathan 70 degrees are resched. If fired at elevations co-ceeding 70 degrees, projectiles may fall base first, as will be clear by reference to startch No. 8. It should be understood that the angles mentioned vary somewhat, and depend on the projectile used, its valocity, and its speed of rotation. In general, for high-angle fire a fairly low rotation is used (1,500 to 4,000 revolutions per minute), in order that the projectile may respond quickly and fall point first. As low valocities are used for high-angle fire, a low speed of rotation will ensure stability. It can readily be seen from sketch No. 8 that if a projectile has a high speed of rotation, and, consequently, a precession of allow rate, and small amplitude, there will be a definite angle of elevation for that projectile, such that when the projectile reachies the top of its trajectory the direction of the air resistance. simplified, there will be a definite angle of elevation for that projectile, such that when the projectile reachish she top of its trajectory the direction of the air resistance will change feater than the tendency of the point to follow. It should be borne in mind that owing to the low velocity of the projectile at the top of its trajectory, the groscopic moment is very small, even atthough the love are mincreaser applidy with the change of direction of the air resistance. The groscopic moment being resistivity small, the projectile change the dependency of the projectile dips and tends to follow the rangidy-changing direction of the air resistance, it lags behind in this movement. There soon comes a time when the diedician of the air resistance is broadcide to the projectile and directly through the center of gravity. As the point of the projectile and directly through the center of gravity. As the point the projectile has no tendency to precess, and travels broadcide through the air, the procession peak falls below the sunser of gravity. The direction of the air resistance is not the projectile approaches this deconding transit of the thraptory the air resistance. That is, the home of the projectile with the base of the projectile propositie gravity and the resistance. That is, the home of the projectile with the base of the projectile propositie gravity and the country of the projectile. This tends to text a present on the projectile or resistance. That is, the home of the projectile to come over to make the like of the air resistance, and therefore the projectile approaches the projectile and the projectile file home of the projectile of the such as the projectile projectile. This is dead to text a present on the projectile of the projectile approaches the file of the projectile approaches the contract of the projectile approaches the projectile approaches the contract of the projectile approaches and the projectile approaches and the projectile approaches and the projectile approaches and the projectile a

The state of the s

n beyond which the projectic falls bese first ad somer in proportion as the speed of rotation and, the projectic shortened, said the velocity

In May, 1912, five 12-insh projectiles were fired from Indeed Bastes draysy morture at an angle of elevation degrees. The observing party constanted of four new sant three calleted men. All five projectiles som in the descending branch of the trajectory, points down. The results of this firing confirmed is inviviously obtained from similar firings. Majdantory firing has also been obtained at angles games as 70 degrees, though it is found that the drift of the projectile is illedy to be irregular at this eleva-

The angle of elevation which decides whether the colorlie will fall point first, or base first, depends to

h an extent on the variables previously mention suce an extent on size variables previously mentioned, that it is not possible to state more than that for the conditions under which mortars are fixed the angle is probably not much greater than 70 degrees. Mortar fire is usually limited to angles of elevation of 65 degrees.

### Authorities

A large number of scientific authorities might be quoted, all of whom are believers in sketch No. 1. The eminent German authority, Prof. Cranz, and the eminent British authorities, Prof. Greenhill and Prof. Henderson have demonstrated that the axis of a projectile remain seven denomensate unate the arts of a projective remains sensibly tangent to its trajectory. Brig.-Gen. Wil-liam Crosier, Chief of the Ordnance Department of the U.S. Army, also maintains the correctness of sketch No. 1. There is not an authority in any country who maintains the correctness of sketch No. 2.

It should be understood that the foregoing discu of the flight of projectiles is complete only in so far as pertains to the object of this article. No mention has been made of the nutations described by the point of the projectile, or of the motions occasioned by forces impressed on the projectile on leaving the gun. is much information that could be given on the action of the air resistance, the effects of various riflings, etc. but none of these have more than an indirect bearing on the subject, and do not change in any way the deducone in this article

It is believed that the credence given to sketch No. 2 has been due wholly to popular misconception, and it is hoped that sufficient data have been presented in this article satisfactorily to establish the fact that a rotating projectile in flight must have its axis at all times sensi-bly tangent to the trajectory.

# High Temperatures and the Electric Furnace

### The Different Types of Electric Furnaces

By Prof. Joseph W. Richards, Lehigh University

JITHIN the last twenty years, e est has been a favorite topic of discus nists and metallurgists, and the possibilities of using En menteratuj are attracturi greet attention. Various kippes de destrie furnaceo have been devised and put fa, operation, for such various purposes as producing pige iron, meiting steel, meiting brass and bronze, mak-ing silicon carbide, calcium carbide, tittanium carbide, maching silicon carbide, calcium carbide, tittanium carbide, ng shoon excuse, esseum escoue, usaama escoue, converting ordinary earbon into graphite, melting quarts, fusing glass, reducing tin cres, melting gold and allver precipitates, converting nitrogen and oxygen in the air into nitrio acid. In fact, the uses of electric us that a large-sized furnaces have become so varie rurances nave become so various tont a large-sized book can easily be written about it, and several such are already in print in the German, French and English languages. Any bookseller, or importer of French or German books, can furnish this literature to any one interested in it.

There are various types of electric furnaces, adapted different kinds of service. For some purposes extremeto different kinds of service. For some purposes extremely high temperatures are necessary, and for these the electric furnace is indispensable, since the result desired cannot be obtained in any other kind of turnace. The highest temperatures attainable by combustion of solid or geneous tud, with pre-hearted air, approximate 1,500 to 2,000 deg. Cent. (2,700 to 3,000 deg. Fahr.), and it takes a large consumption of fuel and there is a large waste of heat in attaining such temperatures on an industrial scale. The electric furnace, however, is limited in temperature only by the resistance of the material temperature of the carbon electrodes used for carrying temperature of the carbon electrodes used for carrying temperature of the carbon electrodes used for carrying approximates 3,700 deg. Cent. (0,700 deg. Fahr.), which is above the melting point of any ordinary material approximates 5,000 deg. Cent. (0,000 deg. Fahr.), which is above the meiting point of any ordinary material with which a furnace can be lined, excepting carbon. The ordinary refractory materials used in furnaces burning fuel melt at a temperature between 1,500 and 2,000 deg. Cent. (2,700 to 3,600 deg. Fahr.), and carbon

Ourning rise meet as described and weeken income and a practically the only makerial which will stand the highest temperatures attached which will stand the highest temperatures attached which will stand the control of the standard which will be supported by the standard in the standard way high temperatures. Some of the most furnaced view high temperatures. Some of the most successful election furnaces, operated where electric power is cheap and fruit in relatively does, are operated at temperatures no higher than are obtained in ordinary mon-electrical furnaces. The electric current is in this respect somewhat like a race-horse which is capable or running at high speed (high temperature) and yet which can be loaded down so as to work at low speed upon heavy loads (for temperatures). In fact, the ordinary electric oven or the loaster used in our houses it on the principle of an electric furnace, but operates at very modeltes temperatures.

### Arc Pur-

Such furnaces are simply enormous electric furnaces, on the same principle arean electric are used for lighting, excepting that they are surrounded as completely as possible by the material: to be heated, and the heat radiated from the are is utilized for purposes of fusion, radiated from the are is utilized for purposes of fusion, chemical remotion, etc., The maximum temperature chemical the maximum temperature chemical the section of the sec the average temperature to which the electric energy converted into heat in the arc is capable of heating this large mass of material; this temperature may be almost anything, down to ordinary low furnace tem-

persurve.

Illustrations of the use of the arc furnace are the Stassan furnace for melting steel, the DeLaval turnace for melting sinc ores, the calcium carbide furnace, the ferro-silicon furnace, the furnace for fixing atmospheric nitrogen and thus producing nitro sold from the six. These furnaces work with the material heated from 1,500 deg. Cent. (2,700 deg. Fahr.) to 3,000 deg Cent. (8,400 deg. Fahr.). Their obsemical possibilities depend upon sible one of two things, first, that materials for reactions are produced in them not producible in furnaces run by fuel (nitric acid, calcium carbide, ferrofurnaces run by fuel (nitric acid, calcium carbide, ferroon), or, second, that they are cheaper to apply than ordinary furnaces (smelting zinc ores and melting

wel, in Sweden or Norway).

I have mentioned some of the more common applica-I have mentioned some of the more common applica-tions of these commons are furnaces, but many others are under experiment and will undoubtedly be de-veloped in the future. Their real and proper field is for carrying on operations at high temperatures not obtainable by other and non-electric means. Resistance Furnaces.

This type of furnace passes the electric current con-tinuously through some material offering resistance, and generates ther(in the high temperature required. There is no are or break in the electric circuit; these furnaces are run simply on the hot-wire principle— a conductor is heated by the passage of an electric current, and sufficient current is sent through a particularly designed resistor to generate the heat and tem-perature necessary for running the furnace.

persure necessary or running the turnace, This is a large, useful and important class of furnaces, which is entering into many industrial operations. They are preferably operated by alternating current, although this must be of low voltage for most resistance furnaces. Examples are numerous; one of the simplest rurances. Examples are numerous; one or the simplest is the furnace of Mr. Acheson in which several tons of ordinary anthracite coal is converted into graphite by the passage of the electric current through the coal the passage of the electric current through the coa-isself, thus heating it (properly shielded from the en-trance of air) to a temperature of at least 3,000 deg. Cent. (5,400 deg. Fahr.) during a period of about twenty-four hours and converting it into soft unctions twenty-our nours and convering it into sort uncertons graphite of many times the value of the material put in the furnace. Another example is the mixing of ordi-nary silica sand with coke and saw dust, and passing an electric oursets through a heap of the material piled between electrods terminals twenty to thirty feet apart. between electrode terminals twenty to thurty test apart. With a voltage of 100 to 200, and a current of over 1,000 horse-power, the electric current generates within the mass a temperature sufficient to form from these ingredients the well-known material "Carborundum," which is formed at a working temperature of 2,240 dag. Cent. (4,000 deg. Fabr.). Large industries have a few factors and the contraction and use of these contractions are used to be contracted and use of these contractions are used to be contracted and use of the contractions and use of the contractions are used to be contracted as a contraction and use of the contractions are used to be contracted as a contraction and use of the contractions are used to be contracted as a contraction and use of the contractions are used to be contracted as a contraction and used to be contracted which is retimed at a working temperature of 2,240 deg. Cent. (4,000 deg. Fahr.). Large industries have been founded upon the invention and use of these electric furnaces, so simple in principle and yet which require the highest inventive skill and industrial peracity to devise and operate successfully. Induction Furna

These are really a special kind of resistance furns the material or resistor being heated by the passes the massetal or resistor being heated by the passage of an electric current, but not by the ourrent originally sant to the furnace. The furnace itself is an electric stransformer, receiving high-voltage alternating electric current, and triansforming it to low-voltage current of great quantity, and the induced or secondary current of the tensetormer is the heating current which passes through the resistor and doing the useful turnace work. A reference to the ordinary transformer with which

almost every one is familiar may make the matter clearer. Electric current is sent along many of our thoroughfares at 2,000 volts tension, a current which would be very dangerous if it entered our houses, but would be very diagrees in it cancers our noises, but which is transformed at convenient stations into low-tension current for safe use. The apparatus accomplish-ing this is called a transformer, the original current passing through the primary winding of the transformer, while the useful current is taken away from the secondary winding. The induction electric furnace operates on exactly the same principle; it has a primary winding receiving the high tension electric current but its second-ary winding is the material itself which is to be heated, arranged in a closed circuit, so that all the energy of ondary electric current is utilized as it is generated in the furnace itself.

These last are in reality not primarily furnaces; they are furnaces only sucidentally. If we electrolytically decompose a liquid by passing a direct current through it, the operation is electrolysis. Such operations are familiar to every one: Gold, silver and nickel-plating baths; electrolytic refining of copper, silver, gold, load; electrotyping; electro-engraving; reproducing coins, medals, etc. Others less well known are the obtaining of metallic sodium from fused caustic soda, of calcium from melted calcium chloride, of aluminium from a fused bath containing fluoride of aluminium and sodium with alumina (alumnium oxide) dissolved in it. Now, when these fused baths are kept melted by the heating effect of the passage of the electrolyzing current itself, the apparatus is called an electrolytic furnace. therefore, a pot primarily run for electrolysis, whose necessary temperature may be maintained by externally-applied heat (as by building a fire around the pot); but when this necessary temperature is maintained by the internally-generated electric heat, the result is not amply an electrolytic cell, but an electrolytic furnace The amount of heat generated by the current depend on the strength of current and the distance of electrodes apart; it can be regulated with exactness to that required to supply radiation losses and keep the contents at the proper working temperature. Sir Humphry Davy was the first to experimentally use this principle, Mr. Charles M. Bradley of New York patented the electrolytic furnace, and Mr. Charles M. Hall was the electrolytic furna the first to practically run electrolytic furnaces in the production of aluminium.

These types of furnaces, with others possibly still These types of turnaces, with others possibly such to be invented, are revolutionizing many branches of industrial chemistry and metallurgy, and are founding or establishing many new ones. They deserve serious and intelligent attention.

The German Observatory in Spitzbergen, which was established by Prof. Hergesell partly with a view to determining the meteorological conditions that will be concerning the meteorological conductors that will be encountered by the projected expedition of Count Zeppelin eta airship to the North Pole, has completed a full year's work with such fruitful results that it has been desided to keep the institution in operation an-other year. The two observers, Drs. Rempp and other year. The two observers, Drs. Rempp and Wagner, have been relieved by Dr. Kurt Wegener, lately in charge of the Samos Observatory, and Dr. Robitzsch. During last winter a series of aerological observations was carried out with kites, pilot balloons, earliev balloons, and sounding balloons, yielding a unique body of information concerning the winter conunique body or information concerning the winter con-ditions in the upper air of the Arctic regions. Valuable contributions to the climatology of Spitzbergen were made through the maintenance of three meteorological made through the maintenance of three meteorological stations at different altitudes; the highest on Mount Nordenskjöld (3,360 feet). Unbroken series of mag-netic and seismological observations were also made.



Six Cylinder Models

WE announce for 1913 big improve-ments in Chalmers cars in comfort, convenience and appearance. For it is along these lines that we believe the greatest advances in automobile building are to be made.

Few changes have been made in our chasses. The mechanical features of our cars have been right from the beginn Satisfactory service in the hands of 27,000 owners proves this.

Here, then, are the principal additions and improvements on Chalmers 1913 cars:

### Easier Riding Qualities

Luxurious comfort is built into every detail editarrous contror is outli into every detail of Chalmers cars. The Turkish cushions, 11 inches thick, are soft as a down pillow. They are the highest grade automobile cushions

The unholstery is of the luxurious overstuffed type. All seats are wide, filled with high grade hair and covered with heavy, soft, pebble-grained leather. A Chalmers car gives you the same restful comfort as a big armchair.

The long wheel base minimizes road shocks. Big wheels and tires, and long elastic springs make all roads smooth. You can ride all day in a Chalmers without fatigue.

### More Conveniences for Operator

Electric Lighting, the last touch of luxury, nt for 1913 on the "Thirty is regular equipment for 1915 on the Six" and the "Six." The Gray & Davis syst which we use is featured on some of the highest priced cars: we believe it is the best light

Just touch a switch on the dash and you can light at will head, tail, and side lights. No hunting for matches or gas tank key. No get ting out of car in dust or mod.

And no more cranking. The Chalmers are pressure starter made 1912 a self-starter year. A season's use has proved this the simplest and most efficient starting device yet designed. You simply press a foot button on the dash and compressed air, released from a tank beneath the car, turns the motor over until it starts on its own power. No danger. No strain on motor

Continental demountable rims reduce tire trouble to the minimum. Occasional nunctures you may have are no longer a serious incon-venience. With demountable rims you can change tires in a few minutes.

HER DER BERTEIN DER FERSTEN BERTEITE BERTEITE FERSTEN BERTEITE BERTEITE FERSTEN BERTEITE BERTEITE BERTEITE BER

On the new style Chalmers dash is carried every control and indicator—ignition switch, self-starter button, electric light switch, speedometer, gasoline pressure pump, carburetor adjustment, sir gauge, oil sight feed, priming lever, horn bulb—all easy to see and easy to

### Added Beauty

Chalmers cars have always been known for Chalmers cars have always been known for their "looks." For 1913, they are even more beautiful than in the past. Flush-aided metal bodies have the graceful bell-shaped back. Dash is of one piece with body. Top of hood and sides of body form one line from radiator

Handsome nickel trimmings will be regular equipment. Leather lining throughout the body and on the dash leaves nothing to scratch or and on the dash leaves nothing to scratch or mar. Twenty-one costs of paint and varnish

We have perfected Chalmers cars along these lines, we believe, to a greater extent than any-one else, because for the last ten months we have directed all our efforts to making our cars even more comfortable, more cor more beautiful than ever before.

### The Chalmers "Six." \$2400 -A Maximum Car

Quantity production and increased manufaca make possible this upprecedented price of \$2400. Here is a tried and proved sx-cylinder car of the finest quality—of Chal-mers quality—the first thoroughly high-grade sx-cylinder car at a moderate price.

We are proud of this car. No automobile can give you more service, more enjoyment, more satisfaction and pride of ownership than

In addition to the big features of Comfort, Convenience and Beauty listed above, please note the following:

### Power Enough For Anyone

Tower Leavage II or March is a giest of power.
Though rated at 54 h.p., it actually develope 60 to 16 h.p.. The long aroten motor—47 love a 35° series—jeve a strong "jud" is said from and or on the seropest hill. It may be shortly ded own to a winted power on high past. It puts up instantly. An ideal motor for every requestern—inside-diminist speed, after maning an city truth, bull chinking, or degged ploughing through said or mad-

### 18 Notable Features & Cars for 1913

Electric Lights Turkish Cushio Eleven-inch Unbok Nickel Trimmings New Flush-sided Bodies

Long Stroke Made Da Special Silk Mohair Top Collular Radiators

relled Magnetic Speedor 4-Forward Speed Transmission Big Wheels and Tires Dual Ignition System Carburetor Dash Adju

Rain Vision Windshield

### The Utmost Flexibility

Chaimers four-forward speed tras chammers four-forward speed transmis-ation provides a gear for every requirement. It enables you always to select the gear that will carry your car through any kind of going in the quickest time and with the least strain.

Bid wheels and tires -35" x 414"-insure easy riding and cut down tire trouble and ex-

Control levers inside the body; pedals for clutch and position prime stance the body; pedale for closch and brita conveniently located; improved accelerator which does not the the foot; pussible stanced valve leader the transaus; acceptional offing facilities; controls on death within easy resch—make the "Bit" a delightful car to drive.

### You Feel Safe in Your Chalmers

The most careful statetion has been given by Chainess sugitions to the fectors of safety. Where a retained greatly, Adde are both to or own factors but be given grown said. Double drop furness are herry and of front hast transact seed. Brakes are seen keep and of the transact seed. Brakes are seen keep to propose to the weight. Sherting gas in of one Chainess are suggested to the weight are heavy drop found connectionations account or saids: to openin.

Even to the smallest death, the "Eix" is a maximum or. Does looks are occasible and equally accessible from inside and copieds. Bodies are throughly workland. All parts of the our are unestably accessible.

### The "Thirty-Six." \$1950-With Fine New Features

Striking improvements and added features make the 1913 "Thirty-Six" more than ever an ideal all-around motor car. It has power in abundance, speed, hill-dimbing ability and regged endurance to meet the utmost demands.

First offered to hovers last war, this car ha Proved the most popular ever sold at the prise.
Many refinements and improvements for 1915
give even greater amoothness, quietness, confort and convenience. For style and good looks

The wheel base of the 1913 "Thirty-Six has been increased to 118 inches, which still further improves its easy riding qualities.

Luxurious Turkish cushions, 11-inch up-Solitory (the same quality as used on some \$600 cars), tited serts, all give the greatest goodle riding ease. Seats are exceptionally

Big 35° x 4° tires carry the car smoothly seer the roughest roads. The "Thirty-Six" is seer-tired, which means less tire expense.

### Electric Lights on These Cars

Pull electric lighting by the Gray & Davis system is mished on the "Thirre-Ris."

Chalment self-starter, simplified and improved, is imished on the "Thirty-Bix" of course. A refishle Speedometer, a jewelled, magnetic intere-tions, is regular equipment.

1913 begins are greatly improved in design and finith.
They have the integral covied desh, on which are carried all controls. Everything for the handling of the car is while seay reach.

warms only reach.

Note the wide doors, amouth straight aides, rounded
but, graceful covied dust, elegant appointments.

The "Thirty-lik" has even more graceful lines than
but year. The painting is of the highest quality.

### Mechanically Correct

This car will do your work with powe spars. The splendid tang stroke motor—4 is "
is is"—has wonderful pulling qualities. Quiet
and smooth running at all speeds.

The four-firward speed transmission is one of the distinctive Chalmers' features largely responsible for the success of the "Thirty-Six"

was year. Other Calciums Secures which made this our spot a marked concess are possible—both up deal lightion. Oursemake from the lighting the control of their weight and strongs, I The 1911 Calcium "Pairty-Aid" often you every state to be control of the lighting the lighting that the li

Chalmers Motor Company Detroit

Turing Car, S-passeyer, \$1950 Tepola, S-passeyer, \$1950 Lenavine, T-passeyer, \$1250
Turing Car, T-passeyer, \$1210 Roother, 2-passeyer, \$1950 Cupi, 4-passeyer, \$2220
Tran solide full evaponest.

# The New Chalmers "30"-

### Self-Starting, \$1600 With improved motor, Chalmers self-starter,

34"x4" tires, demountable rims, larger beakes beautiful, new flush-sided body, the 1913 "30" at \$1600 is a greater value than ever before.

The price includes also gas lamps and oil lamps, Prest-O-Lite tank, dual ignition, full For the man who wants a light, fast, low priced, but classy car, the 1913 "30" is the best buy ever offered.

The Chalmers "30" has for five seasons set the standard of values among medium priced cars of this power. It has won more endurance contests, broken more records, been victor in more races than any other car of its size and power. And it has a wonderful record of steady

Two body types are offered: 5-passenger touring car, \$1600; 4-passenger torpedo, \$1600.

### Fixed Chalmers Policy-Quality Cars at Medium Prices

For 1913 we are adhering to our established policy of always giving the greatest possible value for the price. We have incorporated in our new model, at medium prices, all of the features of higher priced cars and many features not found on other cars of any price

Chalmers cars have always been known as quality care. We have never built a "cheap" car, but always high quality cars at medium prices. Big production has enabled us to build such cars at lower cost than could anyone without our volume. We have never tried to secure big volume, however, at the expense of quality or advanced features. Yet each year the dinary values in our cars have brough

1912 Our Record Year

This past year, 1912, was the best year we ever had. It set a new Chalmers record. Our business showed an increase of 43% over the season of 1911. We believe that our business will further increase as people approxist quality at medium price instead of quality at high prices or mere quantity at low prince.

We believe the more automobiles come into use, the greater will be the conviction that it doesn't pay to try to save \$310 to \$500 on the original price, and buy something merely be-cause it is offered at a low price.

CONTRACTOR OF THE PROPERTY OF

Medium priced cars of quality-not only ours, but other good medium priced cars-offer the best values for the money in the long run, and you don't have to run them very lon-

### Built in Our Own Shops

Chalmers cars are built by Chalmers work-men in Chalmers shops under Chalmers inspection. We build our motors, transes, self-starter, steering gear, and other important parts. We cut our own gears, heat-treat our steels. We even have our own foundry.

No seferable manufacturer builds in his twn plant more of the parts of his car than we do. No motor car factory is more completely equipped with new machinery.

Reports tell as no car is built with greater care or more skillful workmanship than the Chalmers; none is sub-jected to more careful and painstaicing impaction.

### Backed by Sound Guarantee

Chaines can are bell and guaranteed by a company of the soundant francial randing. We have a plant covering 30 scene of greater and have \$6,000,000 towested in our battleass. We have note this guarant inventional because we appet to be in the business permanents, and we are concluded that permanent business can only be built up when a marefacturer makes the con- perm.

Making our own parts means greater accuracy in our care and greater value for you. The saving we make by eliminating parts-maken' profits, goes into added quality

We have prepared a book about the Chairment factory. It tells, in an unstitually interesting way, how Chairment cars are made. Write for it on the coupon attached.

### Order Now For Early Delivery

Now is the time to order so that you can get the use of your car during the best motoring season.

So see these cars at our dealers' showncome. If you look them over carefully, we are sure the cars will more than beer out our every claim. Again we say, compare them with other cam-point by point-price by proce-value by value. Your vertice is sure to be favorable.

And don't forget to send the coupon for the booklet "Bury of the Chairman Cat," and our naw cassing. You will find this book about the making of an automobile both entertaining and worth while, to matter what car you failed an in a ... The mail it was

Please seed "Story of the Chalmers Car" and complete information regarding the Chalmers 1913 cars.				
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### Track Laying by Machinery

THE modern track laying machine should not be confused with track laying tools, as this machine is not a tool but a real machine that actually lays tracks as indicated in the accompanying photograph The machine moves steadily forward over the track it lays at a rate of from twelve to forty feet per minute. At the rear of the track laying machine are cars loaded with ties and rails. The cars which carry the ties are in advance of those carrying the rails. The rails are drawn forward on rollers and are connected temporarily one to the other. the rails pass under the cars which carry the ties the latter are distributed upon the rails and spaced apart uniformly. chain of rails thus serves to trans port the ties toward the track laying maor the less toward the track myng ma-chine. As the rails enter the machine, the ties are picked up by a conveyor and carried overhead. They are distributed on the roudbed at the end of a truss that reaches far in advance of the main body of the track laying machine. The rails in the meantime are carried forward and deposited upon ties previously laid. The may be swung to one side or the other in order to allow for passing around The track laying machine is selfpropelling. It hauls a truin of twenty-five cars of material, more or less de-pending upon the grade. A train of twelve cars will carry enough material for a mile of track. This machine, with eighteen men, including spikers, can lay and bolt and spike a half a mile of track per day. With a larger force of men two miles of track may be laid in a single day

### The Wreck of the "Schwahen"

AFTER making a total of 364 flights, in which it covered 28,000 miles and carried 0,045 passengers, the "Schwaben," the first of the huge Zeppelin airships to make regular passenger trips, came to grief on June 28th while anchored outof the obsolete shed at Dusseldorf in a heavy wind. So much did the airship bob about in the massistrom that Capt. Duerr decided to go aloft and ride out the gale. He was just about to cast off the mooring cable at the bow when the nose of the ship burst into flame, and he and his crew jumped for their lives. The flame soon ran the entire length of the sirship, and she was consumed as she swung at anchor, the fall to the ground breaking her back, as shown in the photograph The cause of the catch-ing fire of the "Schwaben" in this mysterious manner is thought to be the working of her frame at the bow, where she was tethered. This is believed to have generated frictional electricity sufficient to have ignited the gas. That the covering of the dirigible also had something to do with the generation of this frictional electricity is shown from the fact that the Zeppelin engineers are perfecting a "neutralized" cloth that can-not be electrified. The airship was in-sured for \$162,000. She had made for her s her entire cost of construction and operating expenses by carrying pas-sengers. The latest Zeppelin, "Hansa," has shown a speed of 49 miles an hour, and the new naval one now building, with 600 horse-power, is expected to travel 60.

### An Earth-driven Clock

I N the ordinary clocks provided with weights and aprings, the clock mechanism drives the pendulum. In the clock pictured herewith, however, the operation is reversed for the pendulum drives the is reversed for the pendulum drives the clock. The pendulum recedves its energy from an electro-magnet supplied with current from an earth buttery. Because the earth currents are apt to vary considerably, a special automatic switch mechanism is provided to check the pendulum when it swings too far. Thus, a constant amplitude of oscillation is maintained. The pendulum is provided with a bob, consisting of a cold of insulated copper wite.



Laying track by machine at the rate of two miles per day.



A coal-milling machine



The tangled wreckage of the Zeppelin dirigible "Schwaben."





General view of the clock

The exciting coll.

Clock driven by earth currents.

sisting of a coil of insulated copper wire the necessar; initial adjustment. The they connect to two springs on which the necessar in a brane care. In the product of the suspended, and then making ried to the top of the pendulum where the with the earth better, A pear which there is a similar bob for making ried to the top of the pendulum where the

manant what happed is received. We clock then, adjacent to the best cell. The poles of the majoric sites tribular conings at self-cited of the cell. Hinner, when courtent flows through the majoric these is either an attraction or a migration, arcording to the direction to which the grarent transit sential the cell.

The dissisting of flow is inhermised by.

a. contact jean, which is statushed; by the pendulum rod. It consists of a small carrier membered on two wheels that run over a twick, sectured to the choic can be pendulum. The outrier is set in motion by two adjustable contact placed, in the battery circuit. The outrier is set in motion by two adjustable contact placed in the pendulum, which push it faceward er backward, depending upon the prayed of the pendulum at the time. Thus alternate impulses are produced in the coll. The pendulum is set to keep the pendulum in section. To oppose an almormal set in the contact pieces are arranged in three parts, so that it the pendulum moves the contract pieces are arranged in three parts, so that it the pendulum moves the contract pendulum that it is the pendulum moves the current. Becently Prof. Silvanus P. Thompson subjected the clotch to a number of tests. In his report he states that if he purposely gave the pendulum a large impulse so that it wump too far, the automatic action of the contact device became evident at once, and after a few awings, the pendulum subject to the contact device became evident at once, and after a few awings, the pendulum subject to the contact device became evident at once, and after a few awings, the pendulum subject to the contact of the sounds awing.

### A Machine That Enables Coul to Be Pumped

N 0 industry is more predifie of disaster, both distressful and coatly, than coal mining, and no other industry of this cocuutry, overing to the crude methods employed, imposes such hardships upon the workman immediately engaged in taking coal from the vein. To alleviate these dangerous conditions J. H. Hosdiley and W. H. Knight have developed a system of mining coal for machinery.

mining cost sy machinery.

Frimarily designed to cut the whole seam of coal into a granular state suitable for coking, this coal-milling machine may modify the art not only of mining coal, but of transporting and consuming it. It is well known that granular or powdered coal, with the sid of water, can be pusped through pipes at far less cost than it can be transported by rail. It is also certain that powdered poal, when blown into a transace with an air blast, burns with much more economy than does lump out when burned on the grate.

There are, however, 100,000,000 tons of coal coked each year in this country, and it is with especial reference to this kind of coal that the inventors have directed their attention.

The milling machine not only cuts the coal from foor to roof into a finely powdered state, but pumps it, mixed with water of the mine, to a distant coal washer or to coal blins adjacent to the coke ovens. It necessarily does away with the use of explosives, and with the coal dust. The system is a peculiarly safe one to use in gaseous mines on this account.

The machine total is automatic, advancing by a simple by draulic fixed mechanism which propels it long the floor into the face of the seam, the rotary cutters on the armature sharf of the induction motor cruting the coal very much as a scircular saw onts wood. The motor is given, in addition to its forward movement, a sidwise swinging motion strong a limited angle so that the proper width may be out. Any partings are, of course, and are separated afterward in the weaking process. A fire engine hose insident and are separated afterward in the weaking process. A fire engine hose insident from some source of vater under pressure enables a 'powerful stream of water to be thrown against the face of the coal while it is being out, thus eliminating all dest and keeping the tools cold. The water carries off the comminuted product to the power car many, whenps it is pumped to keep destream of the comminuted product to the power car many products. The inscipling, owing to its power of advancing dimetry into the coal, will out a slope, an entiry, a recen, or work along the wall.

## nggaja, ses, iy saas ses. sengga businsas

**建设施**国际社会。1.6000

TIS everyo business man has only the content ration of the value of a trade-tic. He does not realise that it is very me the connecting link between the pro-ser and the ultimate concurrer; that it is ser and the ultimate concurrent; that it is symbol of good will, a tempile asset with determinate meny value; that it must shapen and upplied not in a haphasori plus with a dar segard for its psychologi-affect upon the public. Nor does he that the importance of complying such statutory requirements which accure to rty right in a trade

erable with the property right that an wentor acquires by labing out a patent. The following is the sixth of a series of vicies, written by a man who is at once trade-mark, an advertising, and a busi-es expert, a man who has a first hand ge of the value of trademeasureage of the value of trade-marks and of the correct methods of trade-mark exploita-tion. The series, which will be eventually published in book form, will include dis-quesions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elements of good trade-mark, and trade-mark pro--Enitor.)

#### alysis of the Requir Registration. -- VI.

ued from page 181, August 10th, 1918.) The U. S. Sanitary Manufacturing Company was refused registration for a trade-mark consisting of the letters "U. S." with a background of a shield similar to that of the conventional United States The coat of arms for the United States is not registrable as a trade-mark ten years' clause. It has been held that its use in that connection been need teat iss use in that connection is opposed to public policy. (American Sine Company, ex parts, 120 Official Gassie, 324.) The registration of the coat of arms of the State of Maryland soat or arms of the State of Maryiana was refused registration, application hav-ing been made under the ten-years' clause. In another case, registration of a simula-tion of the shield of the United States, with alternate red and white stripes, was refused registration.

It would seem at first consideration that if the object of using a trade-mark is to indicate the origin of a commodity, the most effective marks would be simply the maker's name—"James Brown" for goods made by James Brown, and "William Jones" for goods made by William Jones. This logic would be indisputable if there was a different family name for every individual. But names are limited in neuvique... But names are immed in number—there are eleven pages of Smiths in the New York city directory—and every man has a natural and inalienable right to use his own name. But a personal name may be written, or printed, or stamped in such a way that the peculiarities of writing, or printing, or design, may dominate the name and be the most nspicuous feature of the combination. The trade-mark act provides that "no

(shall be registered) which consists merely in the name of an individual, firm, corporation, or association, not writ-ten, impressed or woven in some particular or distinctive manner, or in associ with a portrait of the individual." ecciation In with a portrait of the individual. In this clause the framers of the act have endeavored to put a logical restriction on the injudicious see of personal names as trade-marks and the endless Higastion that has always resulted from this prac-

The names of historical pers ing) may be registered as trade-marks, but the name of a living person cannot be used without his consent. The phrase is used without his soment. The pursue "Gibson Girl," as a mark for alone, was refused registration, as the word "Gibson" obviously referred to Charles Dama Offi-son, a living actiat. In case of the regis-issidan of the manus of individuals, firms it corporations, the restriction of the law se corporations, the restriction of the na-fact the name must be shown in com-"perfession or distinctive meaner" has been interpreted to mean a presentation

secompanying device are so pron-that they dominate the name and ritins of joitening, or writing, or of an linate the name and throv that they dominate the name and unrow is into a position of secondary importance. The meaning of this clause is best shown by means of examples of proper names, registered and used as trade-marks. Many portraits of living persons are used as trade-marks, notable among them history the face of W. I. Doustas, sho

being the face of W. L. Douglas, shoe manufacturer, and the portrait of Thomas A. Edison, used in connection with his A. acison, used in connection with its heatmile signature, as a trade-mark for Edison phonographs. Among historical characters, the picture and signature of characters, the picture and signature of Robert Burns, the poet, are combined in a trade-mark for eigars; the face of Ben-jamin Franklin is used as a trade-mark for the Satureday Benting Post, and will be found printed on the editorial page of each issue; Bismarck is a name for col-lars; Napoleon is used in connection with a brand of flour, and "Bob" Ingersoll is the trade-mark of a cierca.

a branch of noigar.

It is a definite principle of the common law that fraud vitiates any transaction that it touches. A trade-mark that is deceptive and misleading cannot be protected, no matter if its registration should be accomplished. "Knights of Labor" was refused registration as a trade-mark for whiskey as the evident intent of the for winkey as the evident intent of the mark was to mislead purchasers into a belief that the whiskey was produced by the Knights of Labor, a labor organizatigs. A similar case is exhibited in the attempt to register the name "Masonic as a mark for cigars. Registration wa refused. The name "Malt Myrrh" wa WAS refused registration as trade-mark for malt liquors when it was shown that the liquors did not contain myrrh. The name "Old Country Scap," used in connection with soap in such a way as to lead purch to believe that the scap was manufactured in Europe, was held by the court in the case of Wrisley v. Iowa Scap Company, to be deceptive, and protection again infringement was refused.

A false representation on a trade-mark to the effect that the article is patented, when it is not, is sufficient to vitiate the trade-mark. A trade-mark registration does not protect when it is used on an article different in character, or composition, or origin, from that for which it was registered. This principle is very important. A manufacturer cannot do as he pleases with his trade-mark without recent pleases when me crace-mark without regard to the rights of the public. If the article for which it was registered is changed essentially in composition, or in purpose, essentiaty in component, or in purpose, the trade-mark ceases to be of value. Trade-marks under the United States law are always specific and associated with a certain definite article, and not with the proprietor's general business. In Great Britain and Canada there are general trade-marks, which the manufacturer may use on any article he makes, no matter to what diverse classes these articles belong.

A trade-mark which is technically a valid mark, will be refused registration if, in the epinion of the Patent Office, its registration would be opposed to public policy. A few examples will show what we mean. The phrase "Ask the Revenue Officer" was rejected as a mark for whiskey The Patent Office held that this mark appearing on bottles or barrets, would lead the public to believe that the con-tents had the endorsement of officers of venus men the endorsement or officers of the government. For similar reason the word "Government" was refused registra-tion as a mark for loose-leaf binders. tion as a mark for loose-less binders.

The name of a living con-President cannot validity of the trade-mark had been sub-registered without his written consent tained, would have been to perpetuate (as in the case of any other Hving person), in the case of any other Hving person), in the case of any other Hving person), in the case of any other Hving person, in the right to the coxistate use of the warse of an ex-President not live "direct" as a political to several grachines, ling cannot be registered executant with the high direct of the mans of an ex-President as a trade-particular of the person would have the right mark is not considered executant with the manufacture Singer machines, but only the high direct of the person of registration of its way had by the course that the right in the last few years for ex-Presidents. To to use the name "Singer." as applied to The signature and portugit of Thomas machines of this particular design, beautifulness, was refused registration. The The court said, in the case of Brill v.

-----aevelt Rose" were rejected or application for registration, the rejection being partly because "Rose" had been registered on a previous application, and partly because Roosevelt is a living per-

A trade-mark cannot be a color, because the number of colors is limited, and it would be manifestly unfair to give exclusive use of a color to any individual.

The use of the flag or coat of arms or any foreign power is prohibited as a trade mark. This restriction holds even when the foreign power agrees to the use of its insignia. The Russian Government con-sented to the use of its coat of arms a mark in the case of an appli before the United States Patent Office but registration was refused. The law is mandatory, and is not affected by agree

Any design or picture which has been adopted by a fraternal society as its emblem is not registrable as a trade-mark. For obvious reasons, scandalous or immoral matter is refused registration. trade-mark cannot be a shape, or a pack age, or a container. A trade-mark cannot be the article of merchandise itself, for the "mark" must necessarily be different from the thing marked.

#### Proposed Amendment to the Trade-mark Law.

An amendment to the Act of 1905 i before Congress. This amendment, which will, in all probability, become a law, denies the right of anyone to register as trade-mark any mark which of "any name, distinguishing mark, character, emblem, colors, flag or banner, adopted by any institution, organization, club or society which was incorporated in any State in the United States prior to the date of the adoption and use by the applicant." This proposed addition to the law is the result of an attempt certain manufacturers to capitalize the prestige of various well-known clubs and other organizations. A case in point was attempt to register the initials Y. M. C. A." as a trade-mark. Another flagrant case was the adoption of the emblem of the New York Athletic Cluba winged foot—as a trade-mark by a manufacturer of men's clothing. On for-mal protest by the New York Athletic Club, the registration of this mark was held up.

#### The Trade-mark Status of Patented Articles.

A patent may be defined as an exclusive monopoly in the manufacture and sale of a new and useful invention granted by law for a term of years to the inventor As an offset to this monopoly, granted to the inventor as his reward from the public, the inventor's exclusive right ceases at the expiration of the patent, and any one may manufacture and sell the inve

It would be manifestly unfair to the public if the owner of the patent could, at its expiration, still retain the exclusive right to use the name and trade-mark under which the invention has been sold If this were permitted, the effect would be a partial continuance of the monopoly. The name and trade-mark belong to e-not to the individual-and the arti right to use them goes with the right to manufacture the article.

The Singer Manufacturing Company, when the patents on its sewing machine were about to expire, adopted as a trade-mark the word "Singer" blended with a blended with a mark the word singer blended with a device. The effect of this action, if the validity of the trade-mark had been su-tained, would have been to perpetuate the right to the exclusive use of the word Singer Manufacturing Company (41 Ohio Stat.):

Stat.): "A patentiee or his antignee, by incorporating into his trade-mark the distinctive name by which a patentied machine has become known which a patentied machine has become known which a patentied in the patential and a super-common, after the expiration of the patent take ways from the public the right of using such name. The trade-mark cannot be made a guise for extending the monophy or preventing the experty of the public."

The Singer case is two read of reason of

The Singer case is typical of cases of this character. In the case of Dover Stamping Company v. Fellows (163 Mass 191, 194, 196) the court said

"When one who has a patented article gives to it and puts upon it a name, and calls it by that name and no other, and it becomes known to the trade and to the public exclusively by the name so given to it by the patentee or person controlling the patent, then certainly it may be said that, as a general rule the right to the exclusive use of the name ceases with the termi-mation of the exclusive right to make and sell the thing."

(To be continued.)

#### Notes for Inventors

A New Patent Office Publication.—The United States Patent Office has issued a volume of nearly 500 pages, being a supplement to the manual of classification and termed "Definitions of Revised Classes and Subclasses of Subjects of Inventions."

The purpose of the publication is to explain what is comprehended within the title of the subclasses established by the Patent Office and it will prove a valuable aid to the practitioners before the Patent Office

An Anti-skid Improvement. Rikichy Hi-meno of New York city, has patented, No. 1,030,238, an anti-skid device which in-cludes two side chains to extend alongside the wheel tire and cross chains connecting the side chains at intervals. One of the chains is separable at a point intermediate its length to divide it into two sections and n cans are provided for connecting and disconnecting its intermediate separated ends, the ends of both side chains being provided with means for connecting

Another Peter Cooper Hewitt Lamp. Peter Cooper Hewitt has secured another patent, No. 1,030,178, for a mercury vapor lamp in which is provided a highly exed chamber in the shape of verted U, which has a main light giving portion of uniform diameter and as ex-panded at each end into enlargements ich are partly filled with mercury constituting electrodes. A ecodensing cham-ber is centrally located along the tubular portion to regulate the vapor pressure within the container.

#### Legal Notes

Public Use Proceedings.-Public use proceedings are instated upon the petition of some person or persons believing they are in possession of evidence showing that the invention forming a part of the subject-matter or the entire subject-matter of an application for patent filed by another, was in public use or on sale more than two years prior to the filing of the application for patent. This question of public use is the only material one involved and in a recent case of ex parts Wenzelmann and Overholt, Mr. Billings, the first assistant commissioner, has held that a public use proceeding is not insti-tuted to determine when the party filing the petition made the invention or whether he ever made it and that the sole question to be determined is whether the invention was in public use more than two years before the applicant filed his application

A Copyright Treaty Between the United States and Hungary.—The pirating of a play from the Hungarian and produced with much success in this country is said to be at the bottom of a copyright treaty countly concluded between the United tates and Hungary The treaty gives States and Hungary The treaty gives Americans the right to secure literary, artistic, dramatic, musical and photographic copyrights in Hungary on the same terms accorded to native Hungarians. In return, full copyright privileges are extended by the United States. PATENT ATTORNEYS

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Inquiry No 9262 Wanted to buy a glass which is a conductor of electricity, and the address of the makers of the same

the makers of the same inquiry No 9283 Wanted name and address of manufacturer of pantsions stretchers with champs which is expaise or being folded up Inquiry No 9263. Wanted the name and ad-inquiry No 9263. Wanted the name and ad-ressess of manufacturers of machinery for mak-ing picks ferness.

Inquiry No 9266 Wanted to buy machinery for fastening wire cloth to wooden frames with coppered tacks

Inquiry No. 9267 Wanted addresses of manufacturers of metal specialities in connection with plate or window glass plate or window glass

Inquiry No 9272 Wanted names and addresses
of eigravers and mounters of fine quality maps
or plans of large cities Large order

or plans of large cities. Large order than the first plant of the part of the

Inquiry No 9275 Wanted name and address of manufacturer of stock patterns of platen job printing presses
Inquiry No 9278 Wanted a household convenience and necessity which can be retailed at a profit at a price of from \$1.00 to \$2.00

om \$1 00 to \$2 00 Wanted a machi: e for pack-Inquiry No 9278 Wanted a machine for sep-arating crab meat from the shell om the shell Wanted a machine for shred-

arating crab meat from the shell Inquiry No 9279 Wanted a machine for shred-ding ashestes board Inquiry No 9280 Wanted names and addresses of manufacturers of machinery for stuffing dolls and teridy bears.

Inquiry No 9281 Wanted to buy machinery for bleaching walnuts and ivory nuts

#### Some Plastic Agglutinants

THE word "plastic" expresses the qual-ity of bending, yielding, or flowing under pressure. Plasticity is a condition of fluidity, although it may be something more. Many metals are plastic; the flow of glacers is due to the plasticity or fluidity of the component ice; the earth fluidity of the component ice; the same itself, in fact, flows or moves under pressure. Fibrous substances are not plastic that is, they do not flow under pressure than the pressure that the p as in the case of asphalts and bitumens, lead and ice, or it may be only temporary as is the case with bodies having setting qualities, as plaster of Paris, eacutchous and sulphur, phenol and formaldehyde, or clay before and after burning. In many instances the plastic agent is used with a filler of some inert material. That is, our plastic hody is not only made to take some sired shape but it has to carry particle of some other material with it. Thus, concrete block is a mass of gravel and san Thus. s coherent those is a mass in grave and said held together by the cement; a piece of lineleum is a mass of cork dust held to-gether by a set binder of linseed oil and sulphur or oxygen. The plastic substance must then have also agglutinating qual-ties, i e., it must adhere to the particles of

This opens up a large subject. If the filler is of dense material like sand, say, the binder will hold such particles by mere sur-face adhesion. If the filler be porous, the particles become saturated with the binder and may be said to be anchored thereby, like particles of cork in linoleum or cellu-lose fiber in heavily azed paper. In the first instance, the binder merely fills the oids between the particles of filler. the second, the filler floats, as it were, in a saturating menstruum. If the first is of a not pull the particles completely together and must either put itself under molecular strain or it must leave voids or openings in its mass. In the second instance, if the agglutinant is one that shrinks, the whole mass is merely pulled closer together or reduced in size; that is, the object shrinks on drying or setting.

whatever materials may be put with it.

#### Binders With Hydraulic Qualities.

Agglutinants or binders are of many kinds and uses Of one familiar type are those which have setting or hydraulic qualities. The most prominent exponent of this type is Portland coment | Lake all ements it has the property of setting, i absorbing water, and by means of this becoming hard and coherent. The water in this instance becomes a part of the mass and helps to form a hydrated silicate of perhaps several, the exact nature of which is still somewhat in dispute.

Another common binder is plaster of Paris. This also possesses the property of hydrating Its uses in the arts are nume the most common being as an ingredien of wall-plaster, where it is combined with various agents for controlling or retarding the rapidity of its setting Mixed with alum it forms the material known as Kee cement, from its discoverer-the alum

making the plaster harder Another binder is magne When magnesia is mixed with a solution of magnesium chloride it forms a compound, an oxychloride, which is quite hard and wears well. It is a principal ingredient in many compositions for composite floorsin bathrooms, kitchens and similar loca-tions. It has been proposed as a binder for fuel briquets

#### Linseed Oil and Vegetable Binders.

The number of binders of vegetable used is linseed oil If this oil be given a sufficient supply of oxygen it oxidizes into a resinous body—dries, as painters say This drying can be accelerated by supply ing it with an oxygen-transferring body ong it with an oxygen-transferring body—a catalyzer, lead oxide is the one generally used. The molecules of this will give off oxygen to the oil and in turn will take others from the surrounding air. Linseed oil is the main binder in linoleum, which consists mainly of ground cork held together by oxidized oil. Various mineral

nut of the tung tree, in a degree ev greater than that of linseed oil. nomenon of hardening is also in part the result of a polymerization—perhaps in sev-eral stages; that is, the molecules, at first eral stages; that is, the molecules, at first of comparatively simple structure, unite to

orom molecules of more complex structure. Gluten, gum arabio, dextrine, are also oc-sasionally used, though their use is mainly that of simple adhesives. They are too brittle and too easily solvent to be very efficient as agglutinants. glutinants. Starch is another When boiled with alkali it often used. acquires better adhesive qualities. The have no hardening qualities

#### Animal Agglutinants

Glue or gelatine, casein and albumen are the animal agglutinants. These can all be hardened, i. e., rendered insoluble by treat-ment with various agents. Tannic soid is the oldest and best known for glue. It converts the soluble glue of the hide into an insoluble tannate which can only be broken up by prolonged treatment with alkali Formaldehyde is another. Chromic acid or compounds containing it, is another These adhesives generally form the vehicles of the various sizes for paper, cloth yarn and kalsomine. It may be stated here that the binders we have been dis users use the unders we have been dis-ussing are nearly all to be found used as vehicles for pigments. A paint is more nearly liquid than the so-called plastic compositions hitherto discussed, but it consists essentially of a body of coloring matter-pieces. consists essentially of a body of coloring matter—pigment, suspended in and held in place by a suitable menstruum. The menstruum becomes hard through the evaporation of a solvent, and through the resinification of the vehicle. Plastic and coating compositions are essentially the

#### Cellulose Fiber in the Arts.

The most universal product of vegeta-tion is collulose fiber. If we separate fiber from the gums, resins and pectoses with which it is arranged in the structure of the plant we get, of course, pure cellulose, and if this mass of fiber be beaten, matted or felted together into a sheet or layer we get approximately pure paper, like filter pape or blotting paper. Cellulose fiber is insolu-ble in water, but if the fibers be pressed crushed, rubbed together in water for a long time, hydration of the cellulose can be carried to such a degree that the filler breaks down and becomes a slimy.mass which will dry bone hard. If a sheet of paper be heated in a concentrated solution of zinc chloride it is gradually dissolved. If this solution be squirted through a fine hole into alcohol a firm thread is produced which may be carbonized to make carbon lamp filaments. If the sheet of paper be incom-pletely gelatinized it becomes, after suitpletely generalized it becomes, arter sur-able treatment, vulcanized fiber. If a sheet be passed through sulphuric acid it becomes vegetable parchment. If a solu-tion of cellulose be treated with carbon disulfid, a soluble syrupy compound is formed which separates into its constitu-ents—alkali, carbon disulfid and cellulose. The amorphous cellulose thus obtained is known as viscose. It is used in sizing pulps and generally as a carrier or vehicle for coating paper and fabrics. It is also combined with cork, leather, etc., to form place tic masses. It may also be drawn into fine threads or filaments They are somewhat used as substitutes for silk but are weaker n wet than other artificially ma ments. They are not especially inflam

If a mass of pure fibrous cellulose be treated with a mixture of nitric and sul-phuric solds there results a nitration of the celluloseandformation of nitrocellulose. The nitration may be carried to a varying exten the N.O. (nitric oxide) radical replac ing th the Nio, initio oxide) radioal replacing the Hi the cellulose, the mass formula of which; is given as C., H., C., to any number, from one to twelve. Bloom Nio, represents a strong oxiding radioal the higher nitrates are very rich in oxygen. They are therefore useful as explosives, gan cottent and smokeless powder containing them. The lower intracts, while inflammable, are jood, readily explosive. When dissolved in said-Insulative No. 221 Wasted to buy machinery forman manny of ground cork field to | readily explosive. When disposed in smitch | 22 is used resident for many field off. Various majoral value of manufacturer of controlled associated associated of the controlled associated of manufacturer of controlled associated associated of the controlled associated the controlled associated of the controlled associated the controlled ass in the way the first of the second of the second of

factors by medition and is may parent if a proper solvent is used. It it here is that it does not stick wood. It is used in the man buttons, combs and orns: kinds, in making which it is h it is see

with a heavy charge of filler. A solution of nitro-cellule or souirted in the form of a fine filame from a suitable orifice into some medius which will dissolve or withdraw the solven This produces so-called artificial silk similar process is employed for me artificial horsekair and whalebone.

#### The Colluloid Industries.

Celluloid when deposited from many Celluioid when deposited from manys solvents is transparent. In this sheet it is as transparent as glass without the slight greenish tingo which most glass, in the opinion of experts, imparts to objects seem through it. The fact that it can be made: through it. The fact that it can be be in bands of indefinite length renders it especially useful for picture films. These films are usually made by allowing a proper that it is advant to fall upon a solution in a volatile solvent to fall upon a moving band or wheel. As the solvent evaporates, the film acquires coherence enough to let it be lifted off, dried and enough to let it be litted off, dried and trimmed. It may be coated then or later with the proper sensitive emulsion. There are said to be three hundred moving pic-ture theaters in New York alone, there are two hundred in Berlin, as many in Paris, and more in London. The demand for this purpose is said daily to amount to almost purpose is said daily to amount to almost 600,000 meters—in value over a hundred thousand dollars. These films are inflam-mable to a high degree however. This has led inventors to attempt to find suit-able substitutes. The best of these is prol-ably cellulose acctate—a compound cor-responding to cellulose nitrate with a corresponding to centuose nitrate with a cor-responding change of acid. This changed result is attained usually by acetating hydrated cellulose and dissolving the product and treating as with nitro-cellulose. The cost is almost ten per cent higher but the product is not dangerously inflammable. It will, of course, burn like all or-ganic substances, but it is no more inflammable than so much wood.

Chemists in certain Gorman labora ies have been engaged for years in the analysis and synthesis of escutchous with a view to its commercial production. If vapors of turpentine be passed through a heated tube and condensed by a spray of hydrochloric acid, or the vapors be condensed and agitated with hydrochloric acid, solid caoutchouc (polyprene) will be formed. Another method recently diswhich, by fermentation, is partly converced into fusel oil, 1. e., the higher alcohols These, by subsequent treatment, are con-These, by subsequent treatment, are con-verted into isoprene, which changes readily into polyprene. This seems easy, and there are other processes which seem just as easy, but natural rubber either from plantation or from forests is still the main source of sup-A limited supply is obtained in the ply. southern part of the United States, and from Mexico, from a desert shrub called the Guayule. All natural rubbers contain a varying percentage of resins and gums other than rubber—and Guayule is no exception. The purest in this respect is that known from its principal place of export as Para rubber. There are more than one ed and fifty plants from which

hundred and may plants from which to-ber of one grade or another is derived. Crude rubber is of little use as such. It is too soft and runny. It is usually comis too soft and runny. It is usually com-pounded with sulphur, which hardens and fixes it. The product, according to the proportion of sulphur used, is known as soft or hard rubber. Rubber is ordifically adulterated with a large per cent of sub-mittutes and is charged with a variety of

There are so-called rubber articles made which do not have one per cent of pure new rubber. They have rubber substitutes... rubber. They have runner constituted of the particularly corn-oil, particularly corn-oil, and recisimed rather, with various other cheaper mine and or vegetable diluents.

It is used rather for its elastic, insulating of







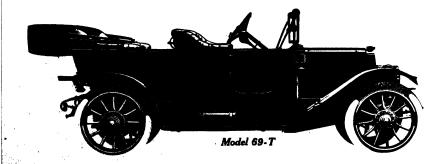
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## How Pyrene Conquers Fires



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fire is the visual and thermal effect produced by the combining of oxygen of the stance burning.

Pyrene extinouishes the ordinary fire by volatilizing when it comes in contact with the fire, thereby forming a non-combusti ble, non-poisonous heavy gas blanket, which settles over and around the burn-

ing material, displacing the oxygen of the air which is essential to the life of the fire.

An Arc is the name given to gaseous metal, or carbon, produced by heat, which is developed by an electric current passing through an air gap presented between the two poles or terminals of metal or carbon. If this gaseous metal or carbon is cooled, it will assume the solid state and will then cease to form a continuous path for the current between the two terminals or poles, causing the arc to break.

Pyrene being very volatile and also a non-electrolyte, when brought in contact with an arc volatilizes so rapidly that it cools the gaseous metal or carbon below the vapor point, thus causing the metal or carbon to revert to the solid state, breaking the arc.

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#### Substitutes for Celluloid.

If a mixture of carbolic acid and for maldehyde be heated an olly viscous liquid soluble in alcohol and acetone will be produced. If this be heated under pressure at a temperature above the boiling point of water, a hard, brittle, insoluble, infusible water, a hard, brittle, insoluble, included index sound for the most part neutral, is and otherwise refractory substance will be discussion of them has been attempted produced. If the treatment is stopped The same binder may be used for making before reaction is complete, the result of artificial stone for carrying a wall pigment. the reaction may be powdered and placed for laying the dust of in molds and again heated. This is the making a fuel briquet.

oork and gutta percha or similar gum and a suitable solvent. This is d flevit to work a suntenue servent. I am in a scott to warra, is expensive, and the solvent makes it in-flammable. Wax tailings, a residum of petroleum distillation modified by various perroteum distillation moduled by various agents, has been successfully used instead. It is said to obviate many of the objections to which the gutta percha or similar binding agent is liable.

The foregoing indicates to some extent

The foregoing indicates to some extent some of the most used plastic agglutimants. It would be easy to extend the list. The fillers being for the most part neutral, no discussion of them has been attempted. for laying the dust on a highway, or fo

#### Recent Research on Lubrication for Gasoline Engines By Theo. M. R. von Keler

THE lubrication of gasoline engines products in the exhaust are due to the presents a problem materially different from that which confronts us in ordi nary steam engine practice. This is imately evident when we consider that mediately evident when we consider that the temperature in the cylinder of a steam engine may at most reach about 500 deg. Fahr., while in an internal combustion engine it rises as high as 2,640 deg. Fahr. Added to this is the fact that the piston speed in a gasoline engine is considerably greater than in a steam engine. Just what hannens to the lubricat ing oil in the operation of a gasoline er gine is not precisely known, but there car be no question that a considerable por-tion of it burns and is discharged in the exhaust. How much of the oil is de troyed, and how much renains to do its duty as a lubricator, depends on the composition of the lubricant, and the cooling

arrangement of the motor.

There is no doubt that the destruction of the oil by combustion cannot be avert or the oil by combustion cannot be avert-ed; a certain quantity of the oil must burn, and must find its way in this burned state into the exhaust pipe. If this combustion can be made complete, in so far as the burnt part of the oil is conso har as the purnt part or the on is con-cerned, it follows that there will be less residue and less "smoke." A very thick oil, composed of fractions with a high boiling point, naturally will be only partially burned, which would explain the almost universal demand that cylinder oil be medium thick and possess a com-paratively low boiling point—just the opposite from what the average driver or owner of a car would imagine would be necessary. The part of the oil which burns, must burn completely and should not leave a carbon deposit in the cylin-The more carbon there is in the oil, the more oxygen is necessary to com-plete combustion. Oxygen, however, in gasoline motor is a precious sub and practically the entire supply draws into the cylinder on the suction stroke is needed for the combustion of the gaso line itself. The small quantity not then employed is sufficient for complete co bustion of the oil only when the latter does not contain too much carbon.

A series of tests has just been con pleted at the Royal Experiment Station for Testing Materials at Berlin, Germany, which disclosed some unexpected and highly valuable properties of oil of differ-ent chemical composition. The oils exament chemical composition. The oils exam-ined were separated into two portions by extraction with acetone, which dissolves the heavier constituents of the oil. It was found that "treated" oils, that is to may those from which the heavier portion had been extracted with acetone, gave an exhaust free from irritating odor, while the untreated oil, under similar circumstances, gave rise to pungent smoke, highly irritating to the nose and eyes. It is thus conclusively shows that the elements

heavier constituents of the oil.

These tests show also that the various means taken or proposed which are to do away with the nuisance of smoking automobiles do not attack the problem from the correct point. It is not so much a question of absorbing or decderising the exhaust gases, as of a proper selection the exhaust gases, as of a proper selection of the oil best suited for the particular motor in which it is to be used. And this selection should not be made by some sort of "rule of thumb" method, but by a careful analysis based on the acetone method Once decided upon as the best, the oil selected can undoubtedly be obtained from the manufacturers. It would ever be possible to divide the oils into spe cially light ones for automobile use, and heavy ones for steam engines-or to tres with acetone before marketing

Aside from the treatment of lubrication oils with acctone, the science of chemistry knows of no method of analysis at nt, which permits of a correct valuation of lubricating oil for combustion mo-Research is going on in practically every large laboratory, and especially in the great automobile factories and oil refineries, but so far no satisfactory m of has been found, by which the quality of an oil for automobile use can be ascer-tained in the laboratory. It is, however, expected that further tests along the line of acetone treatment will evolve a fairly easy, and yet trusty, method of judging the suitability of the various kinds of lubricating oil for automobile use. [The foregoing is an abstract of a

paper of a more technical character, which is published at length in the current number of the SCIENTIFIC AMERICAN SUPPLEMENT.-EDITOR.]

#### Temperance Beer

N prohibition States or localities a non-alcoholic malt beverage has been put on the market. This so-called temper the market. Tails so-called temperature, beer must contain less than % per cent of alcohol by volume, or it will be subject to the United States internal revenue tax. (See Treasury Decision, No. 1,260, May, 19th, 1969.) The aim has been to mainfacture a temperature beer containing all the ingredients of normal beer except the alcohol, and which shall recemble ft in accond, and when same recember and color, flavor and taste as nearly as per sible. There are several methods of small ing temperance beer. Alcohol is removed from normal beer by methods of covera distillation at low temperature. Hite at distillation at low temperature. Here at or carbonic and gas to blown threship to beer to distill off the slooks! In this can nection the sensitiveness of the allowers olds above referred to should be seemed. After cooling, the non-abstract



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A per cent. This may puting the fermionation, continuating. Fifth an-by patients formal bear. d mater in proper properties that it is difficult to make lyes, that will test like nor-of the heading qualities are be, the maintiacture of mifacture of good consumers made a expensive than perfectly satisfied.

that of norm tional manipulations required. It has ocnormal beer for temperance beer and got themselves into trouble by doing so. Probably this is the only instance where a dealer was legally prosecuted for selling the genuine article for the alleged substi-tute, and this in face of the fact that the consumers made no complaints, but were

#### The Road Congress

CONTRACTOR CONTRACTOR

CIENTIFIC management as applied manner. The most eminent bankers will be be the nation-wide problem of building discuss methods for safeguarding a propagal superviging public roads is to be the er accounting of taxes and assuring business methods in obtaining loans or making the same of the American Road Congress, less methods in obtaining loans or making the same of the same to be held on the Million Dollar Pi Affantic City, September 80th to Octo-

ent for better roads has taken root in every State in the Union. In every community there are men laboring for better roads. The trouble with the movement has been its lack of definite plans and methods for handling the im-mense problem. The plans and methods are provided at the Atlantic City Con-

It is not merely to create er It is not merely to create enthusiasm for an improved system of public roads that the congress is to be held. The en-thusiasm is already at hand. The pur-pose of the congress, which marks the ensolidation of the convention interests ociation for Highway Insprovement, the American Automobile Association and the National Association of Machinery and Material Manufactur-ers, is to deal with every phase of the road subject in an orderly and scientific

The people of the United States are now spending, for instance, more than \$150,000,000 a year on their roads. It is known that they are not getting a full dollar's worth of good road for every do-lar expended. In other words, many mil-lions of dollars expended for roads are actually wasted every year because of un-scientific methods. Some communities do actaally wasted every year because of un-escientific methods. Some communities do not build the right kind of roads. Some build roads designed for light traffic and expect them to withstand heavy traffic, and some build expensive roads where inexpensive ones would give better satis-faction. Much of the trouble is due to tific supervision of construction and maintenance. There are more than 100,000 officials of more or less importance engaged in the work of supervising the ds of the country, and many of these

At the American Road Congress civil is great corporation. Logan Waller Page, service will be thoroughly considered in director of the Office of Public Roads, and its application to road management. Gen. active president of the congress, believes John C. Black, chairman of the United that the gathering in Atlantic City will States Civil Service Commission, will put the road movement on such a basis make one of the addresses on this sub that the time will not be long distant jet. He will explain the importance of when twenty per cent of the public high-multipe the civil service, or wester test wars will have be importanced.

## ing bond issues to build goo is to be a legislative section which will endeavor to point the way to needed re forms in road legislation. The president of the American Bar Association is lend-ing his assistance in preparing the pro-gramme for this particular section of the congre

In conjunction with the congress, there will be a conference of educators with a view to having highway engineering introduced in colleges on a scale that will meet modern requirements. Engineers experienced in road building are not plentiful, and if the colleges could be induced to introduce the right kind of courses, one of the greatest needs of the road movement would be appoiled.

It is believed by President Taft, who is the honorary president of the American Road Congress, that better roads mean greater happiness not merely to persons living in the country districts, but to every human being in the country. Better roads mean that the farmer can haul his prod-ucts at all seasons of the year, doing away with the railroad waste of pulling empty cars back and forth at certain seasons of the year, lowering the general cost of transportation, and finally resulting in a cut in the cost of living to the consumer. President Taft, who is to make an address at the opening of the congress, will point out that the improve-ment of public roads is the best investcongre ment that the American people can make. Of equal interest will be the addr

be made by Governor Wilson of New Jersey. The American Road Congress will be notable in that it will mark the evolution of the road movement from the theoretical to the practical stage. Each phase of the big subject will be handled by the foremost men in that particular line of endeavor. It is felt that scientific manofficials are engaged for political reasons, and not for their ability or competence. At the American Road Congress civil a great corporation. Logan Walter Page, putting the civil service, or merit test, to every man having anything to do with supervision of the roads. Fivey other phase of the road subject will be handled in the same scientific dickers, since toquil to that of France.

#### A Substitute for Wood

THE steadily increasing price of tim-the rediffecty in the stalk. The ripped her in Europe has caused interest to be centreed in a Prochamber of the paring a substitute for this article. The ladd upon a traveling plate. The latter is precess is very simple and inexpensive, kept et a certain uniform temperature the whole process or manufacture being by means of steam, so as to cook the carried cut by a single machine. The tacertified off by a single measure. Are to extra with the state has been carried the champages industry, smbarked upon to the requisite degree intense pressure this stay has been carried the champages industry, smbarked upon to the requisite degree intense pressure this seak with a view to preparing an self-cisies and cheep substitute for packing the or compress the there of straw very bettless of wine, as well as the closes which closely and tightly together, to form a bettes of wise, as well as the onses which at present are inside of word, and (he was of which is persistently rising. The first empiricanes: were under short five years age, and recently some excellent speci-ments of the intentions have been pro-

clies of wise, as well as the classes which is closely and tightly together, to form a present are inside of woods, and the cost which is particularly rising. The first five years in the product of the present of the



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imparting a straight grain-like effect. It genious machine has been devised. In works fairly easily, and when sawn this case the molding plates, both upper lieuves a clean cut. Its attempth is come and lower, have been corrugated to form parable with the ordinary whitewood, and round grooves about a millimeter less in it can be applied to all purposes for which diameter than the square section Swedie inter is thirted in the propagation of fall matches. The plate is made in segit can be applied to all purposes for which the latter is fitted. In the preparation of the greater thicknesses such as for joists or posts the better practice is to build up the baulk with layers about a quarter of in thickness laid transversely. Tests with the material have shown that when the cooking and pressing operations have been carried out accurately, the fabric will not disintegrate, and responds readily to the application of tools, though being somewhat denser than whitewo it is harder to work across the grain. It does not split readily when nailed, and should, therefore, prove highly service-able for making packing cases.

One highly useful application of the invention has been found. This is the production of cordwood for burning purposes. Efforts are being made to introduce it into the Canadian West on the wheatfields of which the straw at present is a waste product, while wood and other fuel is expensive By means of this machine rough wood suited to burning purposes could be prepared very cheaply. The artificial wood burns with a bright long flame, is practically free from smoke, and gives intense heat, so that it is well suited to steam raising purpos

The inventor has also devised a means of manufacturing matches from this substitute. This was not an easy matter as the ingredients associated with the raw straw had to be of such a character that bottle necking. It is neater and cleaner they emitted no smell, snoke, and yet than the straw packing generally embured with a steady finne, as well as ployed for wrapping wines, and after fuligniting readily. Success has been filling this purpose can be subjected to achieved in this connection and an in- other packing uses.

#### A Simple and Efficient Canoe Gum

C ONSIDERABLE need is often experisoft and easily denied. This is the conenced by cancelsts and boatmen gensistency required for a gum to prevent
erally in the lack of a good cance gum crumbling in cold waters, such as Lake to stop leaks or breaks which may occur in the calking of the boat. When ing in the northern waters of Cauada on the lakes in the Adirondacks and the Rockies, it is often inconvenient or im-possible to obtain a ready-made gum which will answer this purpose.

A good canoe gum must answer several demands; first, it must be sufficiently pli-able so as not to break and powder when in the cold water and under strain, sec-ond, it must not melt and run in the sun when the cause is beached for a short time; third, it must not dissolve or soften when in the water; and last, it must set low as possible.

All these demands are adequately met

are ejected in long rows ready for re

manufacturing by this method is less than that of fashioning them from wood

though they are equal to the latter article in every other respect. In the latest ex-

Another application of the same ide

has been the manufacture of a corrugated packing material to take the place of the

corrugated strawboard which is used so extensively for wrapping purposes. This product is far stronger than the straw-

and rolls closer when required, so that

it constitutes an excellent medium for

mes equal resiliency

block as required.

board article, posses

Superior. A material compounded of 10 p vaseline and 90 per cent rosin is quite brittle when cold. However, in warmer waters farther south, this gum is suffi ciently pliable and does not soften or melt readily in the sun.

Addition of rosin makes the gum hard er and more brittle, adding more vaseline makes it softer and tougher, so that any consistency may be had from the hard-ness of rosin to the softness of vaseline.

The above ingredients compounded in the proportions of 10 to 20 per cent of vaseline and 90 to 80 per cent of rosin when in the water; and had, it must set vaseline and 100 to 80 per cent of roads hard in a few moments if it is to meet the will answer all the requirements of an emergency. It goes distributes asying that the raw material in a tin or wrapped in paper, and it melts must be easily accessed, and the price as easily over the fiame of a match and sticks like give to warmed surfaces. Any All these demands are adequately met coloring matter may be stirred into the by a gum compounded of rosin and vasel- hot liquid gum; for example, Chinese ine, and the gum can be made in any blue gives a bluish green color, red lead watertight dish which may be heated over gives a brilliant red, and chrome green watertight dish which may be heated over gives a brilliant red, and chrome green an open fire One part of vaseline and yields a brilliant green. The best proporparts of rosin, by weight, heated tions are one part of mineral pigment to until dissolved in each other will give a one part of gum. The addition of pig-gum which, at summer temperature, is ments makes the gum very hard.

#### The Current Supplement

Tills week's copy of the Supplement Supply.-forms a companion issue to the pres-cies in ent Chemistry Number of the SCIENTIFIC Mr. von AMERICAN. Mr. August Neumark, who, by this time, must be known to our readers from several very good articles which he Soluble Gunnowder touches on an important new development.—Mr. C. C. Hutchins describes the laboratory preparation of quartz fibers -- Welding by elec tricity is becoming more and more important. Our front page illustration forms part of an article on the anbject. -Prof. Gockel writes on the Correlation

-One of the most important articles in this issue is from the pen of Mr. von Keier on Lubrication Problems in Gasoline Engines.—Another import ant subject dealt with is the Manufac-ture of Ethyl Alcohol from Wood Waste. -Prof. Bone recently delivered a lecture before the Chemical Society at Leeds on his "Surface Combustion Furnaces," which seem to be destined to work a revo-lution in Industrial heating operations. An illustrated abstract of this published in this issue,-Mr. Johnson de scribes an ingenious machine for testing iron and steel for their magnetic properties and recording the results graphically.

-Using X rays to fit shoes on one's feet may seem at first sight a trivial applica-—Prof. Gookel writes on the Correlation may seem at mix sight a trivial appusa-between Sun Spots and the Weether—it too, but when it comes to supplying an Mr. Carroll Curtis contributes an excel-lent article on the Enet Coset Fishing grave importance. An illustrated article Banks and the Freservation of Our Finds balls of a new departure in this dissisting.



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periments the inventor has succeeded in producing an excellent substitute for the The quality of the rubber, its unus radiating the friction heat generated roads, the extra thickness of the tre transbe—all combine to yield the long upon which our guarantee is based. wax match, dispensing with the cottor fiber foundation of the latter article.

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49-45 BROADWAY, N. Y. Philodolphia Pittsburgh St. Louis San Francisco has contributed, gives us the first instal-ment of an article on Nitrous Oxide and Its Applications, which will run through two issues—An article by Dr. Raschig on

#### CENTLY PATENTED INVENTIONS.

The state of the s

These columns are open to all patentness. The institute are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCHMPPPIC Augment

Pertaining to Apparel.

INNERSOLE.—P. L. Cosson, 87 Winter St., Rechester, N. H. The innersole is constructed of unusualty thin leather, and is to the innersole at each side of the rib, so that whos the well and upper are sewed to the canves unsher rib the innersole will be relatived by the canves and the strain will relative to the chart of the rib. The construction of the rib. The relative to the rib. The relative at each side of the rib. The r

#### Pertaining to Aviation.

of the rib.

\*\*Pertaining to Aviation.\*\*

ARRIAL PROPELLER.—Rank H. ELIJOTS, LAWYRON, K.M. The principal relative here is the propeller's veriable pitch alterable at The Principal relative here is the propeller's veriable pitch alterable at The Principal Control of Application and the Principal Control of Application and Control of the Principal Control of the Principa

Beccrical Beyless.

O'FRIENDAT TROLLEN', ... A. Fanlas, 280 Pape Ast., Terotto, Can. S. It this case the trolley rope is wound on a spring-retracted drum which is automatically released when the trolley wheel is displaced from the wirs, and whereby the rope is taken the crosses of the control of the contr

tro-magnetic, or mechanical effects. PRINTING TELEGRAPH.—B MOLDATEN. COW. 87 Rue La Phouse. Paris, France. This answention couprises an electro-magnetic device having two distinct actions and provided with a single schenoid by which means it a possible to obtain different and distinct effects it is thereby possible to reduce the consumption of coursel, as well as size and cost of ton of current, as well as size and cost of

apparatus.

ELECTROPLATING APPARATUS —J. W.

BOW. 504 Park Ave. W., Mansheld, Ohlo. Mr

BOW's Inwashion relater generally to electroplating apparatus and more particularly it is
directed to a new and improved construction
adapted for use in depositing metals upon

bodies, the construction being aspectally adapt
ed for use in advorpakting annall bodies.

Of Jaserest to Farmere.

RRLF PITCHRR.—O D HUTTO. Russell.

Springs, Kan. This Javontion relates to an agricultural machine for taking or state-ring grain from stacks and conveying it to a thresh ing machine or the like. Be object of the inventor is to provide a simple machine requiring but little attention for adjustment and operation.

Of General Enterest.

Dist/CR POS DIVELOPING PHOTOGIAPHIC FILMS.—Ds. W. R. Inouran, 725
No. 6th Ave. Tucson, Arts. An object of the
invention is to provide a device having a retainer for such film, the rystacre being hinged
together and so formed that they may be rolled
up in compact form, thereby occupying little
apace and necessitating a mismum quantity
of developer.

of developer.

PLANO ROUNDING BOARD—F. R. Lone,
728 Re. Decadeway, Los Angeles, Cal. The
First Bidwell, Cal. The purpose to this case
and, similar intraged musical instruments are
and similar intraged musical instruments are
and similar intraged musical instruments are
and similar intraged musical interpretations are
and similar intraged mus

window, the parts being managed from within the room; provides means for forming a pas-ageway through the support; provides within the room from which the windows opens to move the laundry to the outer and of the rack; and provides means for forming a con-tract; and provides the rack.

tral passage through the rack.

ALVMINUM SOLDER.—C. R Emerse, 416
Van Der Venter Avv. Autoria. Long island
City. N. Y. This invention relates to an alloy
to be used as a solder for uniting one strip
ting one piece of aluminium to any other suitable untail. The solder may be used for the
purpose stated without the leading of the
parts to be united by a blow pipe or otherwise.

DESK.—S. GARAYADNO, care of D. Garcia, Lagos, Box 5. Monitorideo, Urugusy, South America. This does is of compact form with America. This does is of compact form with the compact of the compact form with the compact form with the compact form with the compact form with the compact form of the compact form

chines. etc.

ADJUSTABLE SCHOOL DERK AND SEAT

—S. MACC. JOHES, SON 76, 1426 Superior St.,

Williamburg, Pe., This leavestion relates to

school rooms where it is desirable for the
faratiture to be adjusted in accordance with

the stature of the several persons to use the
school rooms where it is desirable for the
faratiture to be adjusted in accordance with

the stature of the several persons to use the

school desks made in accordance with his
legation may be reduced ever more than one

haff, and yet easily come within the require
haff, and yet easily come within the require
HRAT INNILATED MESTRACT.

meats of the law in some jurisdictions.

HEAT INSULTATED REVETPACLE.—R.

HARWIN, 12 Bragonsertrasse. Berlin, Germany, Mr. Harwing's invention consists esadapted to be sasied, and providing this joint
with a tensioning device, comprising the insulating ring, near the upper edge of the receptacle, and the inventor prefers to arrange the
tensioning device between the inner and outer
bottoms of the receptacle.

bottoms of the receptacle.

PROPELIZER.—D H BLAKE, exte of J W
Happle, Sanderson, Teass This invention reinter to marine propellers, and the aim is to
provide a form designed to give increased
sellenery in proportion to its size, and to provide in connection with the improved propeller
novel means of preventing a vacuum behind
the propeller.

VAULT COVER —H. SELLHEIM. 357 Ntock holm St., Bidgewood, Brooklyn, N. Y. Thi cover is for use for cellars, vaults and th like, and is adapted to form a strong surface like, and is adapted to form a strong surface which will at the same time permit the pas-sage of light to the cellar or vault below. In this device the transparent members or lenses can be readily removed, for the purpose of renewing the same.

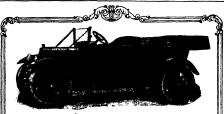
#### Hardware and Tools

Hardware and Tools, WIRE ANCION—P. TRINSER, E. P. D. No. 3, Box 1, Aurora, Ill. This improvement relates to devices for connecting or anchoring the ends of fence wire or the like to posts. The anchor is perferably made of metal which may be of any suitable variety having in view the elements of cheapness and strength, and it may be galvanized for durability and appear.

DOUL HANDLE HOLDER.—C. BERRY, care of Courtel Hotel, Grand Forks, N. D. This investion pertains especially to devices where investions are supported to the state of the state

OII. SWAB HOLDER.—C. E. CALKINS, Las Cascadas, Canal Zone, Panama. The holder is the form of a cup constructed in two hair sections hinged together so that they may be closed about a piston rod. The covers of the holder have fanges that are caught under lugs.

tions CHUCK.—F. J. CORNIL, 228 Cypress St. Argents, Ark. This invention is a combination chuck whereby thin cylindrical work can be held by pressure from both inside and outside at the same time, thereby eliminating distortion. The jawa, which are reversible can be used in the usual manner, and also for can be used in the usual manner, and also for colonipies work thereto, said work being certain the property of the property o



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the Haynes mounted here it. We were working toward such a device their, an
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first Model 22 test cars, equipped with this device, have been put through
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rangement being such that both instruments move in subion, so that persons may be reported in the person of the such that the such that the conversation, the words for the lines which the actors are supposed to say letter as the substitution of the supposed that the substitution of the substit

Prime Rovers and Their Accessories.
(GANGIANN SPIRAY OR VAPORIZEE
VALVE—QUINT EBAINS COMMAN, Quincy,
l'a The object of this improvement is to provide a desire capically adapted to automatically regulate the fuel charge for explosion engines, both as regards the amount and
relative proportion of ingredients of the mix
ture in accordance with the conditions to be

Hailways and Their Accessories

Ratiways and Their Accessories,
AUTOMATIN' (VOIDLING) DEVICE—P. J.
Privri and d. Bairsack, Center and Market
Sts. Totaville, Pa. An object here is to provide a device which will automatically connect the main train pipe section, the steam
pipes for heating the curs, and air pipe for
signating purposes and electric circuits for
provide a coupling head having a removable
head in which the gaskets are disposed, thereby facilitating removal and replacements of
the gaskets.

#### Pertaining to Recreation

PUZZLE TOY.—A. L. POLLER, 24 Hammond St. Hangro, Maine This invention comprehends a novable figure causing amusement became of the fantasic position it assumes, and as a puzzle the device constitutes a measure of exciting great curiosity in attempting to change the figure from one extreme position to another.

Periating to Vehicles.
WEILCLE WHERL. -J. W. McValam, Plymoth, ind. This wheel is adopted to be assembled and bound together to form a continuous wheel from sequents adapted to be ascembled and bound together to form a continuous wheel from sequents are formed so that the members thereof are integrally related; and the maximum rigidity is obtained with a minimum weight

with a minimum weight
LiftITING SYSTEM DOR VEHICLES, L.
R. DALA, 505 CHICLO Ave. Vision IIII, N. J.
This broaden of the control of the contro

DESIGN FOR A SETTING FOR GEMS.—
II. AUKERMAN, Weehawken, N. J. The shape of the base is circular, and the edge comprises six ornamental formations. The side elevation of the design is flaring and slants down toward the base.

toward the base.

DEMVIN POIR A LAMP RHADE.—J. PRIMERSON, Manhatian, N. Y. N. Y. This ornaneatal design for a lamp shade has the characteristic of extreme simplicity of form which
invertificious secures a very graceful result,
both in plan presentation and side elevation
view

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#### Sulphur at Home and Abroad (Concluded from page 186.)

tion of sulphur in all the United States had not reached as high as 5,000 standard had not reached as high as 5,000 standard tons per annum, but due to the opening up of the Louisiana deposit, the figures imped to 127,000 tons in 1904, and 393,444 tons in 1908. Since that year it has fluctuated around 230,000 tons, and last year totaled 265,694 tons. The yearly production of the Japanese mines aver-ages about 40,000 tons, which is marketed principally in Australia. principally in Australia.

The American sulphur interests were, prior to the outbreak of the war with Turkey, credited by the Italians with having obtained control of the sulphur fields of Cyrenaica—fields that extend along the desolate shore of the Gulf of Ridra, which the Arabs call Giun-el-Kebrit, or the "gulf of sulphur," just as they call the immediate region of the sulphur deposits Gebel-el-Kebrit, or the "sone of sulphur."

The alarm of the Italians arose from The alarm of the Italians arose from the landing in Cyrenates from the pri-vate yacht of Allison V. Armour, a little less than two years ago, of a scientific expedition sent thither by the Archeologi-cal Institute of America, and beaded by Prof. Richard Norton, of Harvard University. The purpose of this expedition versicy. The purpose of this expedition was to excavate the ruins of the ancient city of Cyrene, the site of which is more than two hundred miles eastward of the sulphur territory.

· A rumor that the Turkish Government had granted a concession to Americans for the exploitation of the Cyrenaica deposits was so far credited in Sicily as to be made the subject of an interpellative prothe stiff the Italian parliament in February, 1911, by Deputy Vaccaro, of the Sicilian province of Girgenti, where the world's oldest sulphur operations mainly

It was pointed out by the southern deputy that "such a concession would fatally compromise the Sicilian industry," which, he asserted, could absolutely not resist the competition of an American company exploiting the Cyrentica field.

In the month following the deputy's

onery, news came from Cyrene that Her ert Fletcher de Cou, of Michigan, one of the members of the American arche cal expedition, had been siain by a hired trio of Arab assassins. The official report of the murder, as made to the Archeologiof the murder, as made to the Archeologi-cal Institute of America by Prof. Norton-contained the significant statement that "the Italians had apread false reports about my intentions; . . . that our true purpose was not to dig the ruins, but to mine for sulphur."

It is a favorite theory of Italian gists that the island of Sicily, instead of being a detached part of the contin-of Europe, in a prehistoric age form the northernmost part of Africa. Those who held to this belief regard the rich and abundant sulphur deposits of Sicily as the logical conclusion of a virgin strati-fication that must have its origin in the neation that must have its origin in the low mountain range that forms the plateau of Aurigi, to southward of the coastal plain of Cyrenaica. On this coastal plain, in the region of Gebel-el-Kebrit, the evidences of sulphur wealth have revealed themselves to modern science, not as a compact and well-defined area, such as Sicily's, but as a straggling drift, emanating from what, farther inland, must prove to be an exceedingly bountiful store of the mineral. However, it is only that part of the coast territory it is only that part of the coast terripay, of Cyrenaica lying within a few days journey by horseback from the sea that has been explored by Europeans competent to judge of sulphur productivity.

An authority recently delegated by the Italian Government to investigate and re-Italian Government to investigate and re-port upon the sulphur prospects of Orga-nates was Dr. Salvators Gianna, who visited the country in the expactly of sois-mercial stacké of the italian ligaction at Constantinople. Writing in the Section Colossicie, organ of the Italian Considera Institute, Dr. Gianno lately observative.

It appears evident that the substitute some in Cyrenaton describes as angle (1988) Mukhar, Ossis of Abu-Haim, Hare-Decks, Abu-



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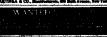
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ing, a line of resistance to the rich mineral drift, of the Stellian coast, which starting from the base of Mount Zina, follows the following the same of Mount Zina, follows the time of the same of the same of the same of the same of the word, may not, indeed, must be same of the word, may not, indeed, must be same of the word, may not, indeed, must be same of the word, may not, indeed, must be same of the word, may not, indeed, must be same of the word, may not, indeed, must be same of the word, and in embry by the Araba, but must be found in embry by the Araba, but must be found to follow the mountainous line that structures from Are del Float to confine the

suad to follow the monatalous line that satteriches from Ars del Pilont to confine the Pilon to Garden Ara del Pilont to confine the Pilon to Barca. That low chain of mountains which extends from heelts Muttar to Gebel-Ala, to Gebel-Garden and the Confine th

cleiclei-Dieria. This follows the little mountainous chain stonding from Muktar to Hara-Docka, and the stratum is so ample that it is to be traced in four days journey by horse to be a superior of the late. The superior is the late of the late, and the mineral without being attached to the rock, presents itself in a pure state, and in greater quantity as depth is attained. The richness of the mineral, from examinal times made on the field of the, quarries in times made on the field of the quarries into made on the field of the quarries indicate that the mineral they obtain is that which is found in the first strutum—speed, at which is found in the first strutum—speed at which is found in the first strutum—speed as were improvement in the quality of the mineral days are improvement in the quality of the mineral days are improvement in the quality of the mineral days are improvement in the chief strutum there is exact ratio to the depth attained. Where this submerged in water.

## Sugar Beet Industry of Germany

(Concluded from page 134.)
The thinning of the beets as well as their cultivation is a work to which (according to the German idea) women are especially adapted. Their wages as field hands are only about 60 per cent that of men, although in this kind of work they do about as much. The extension of sugar beet growing in Germany quickly brought about a shortage of labor and caused the introduction of what is known as the "season workers" or immigrant laborers, who are brought in to work during the beet season, and at the close of it are sent back to where they came from. Every spring hundreds of thousands, in recent years over 400,000 men and women, come from the eastern provinces of Germany, from Russia, Hungary and Bohemia, to the central and western provinces of Germany to work, principally in the sugar

So important has this large n of foreign laborers become that legisla-tion has been passed specifying the time (15th of November for central Germany) by which they must all be returned.

The large property owners have made special provisions for caring for this foreign labor by erecting barracks for then to live in. In addition to a cash wage sh wage an allowance is given in provisions such as potatoes, meat and flour. The beet growers prefer to get as large a propor-tion of women as they can, and as a con-sequence many more women than men are be seen working in the German bee

The influx of such large numbers of for sign workers onto the farms during the summer months naturally has a detri summer mouths naturally has a detri-mental effect, both socially and, morally, and while it has solved the problem of furnishing the inconsery bell furning the summer months, it has presided in driv-ting out the night's farth laborers, who have been untwilling to compete with the season wistless, and thay have gone into colder industries or moved away, so that during the remainder of



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## AVIATION

¶ Two topics are of paramount importance just now in aviation. The one is the possibilities of the hydro-aeroplane—the flying boat in popular parlance-and the other is the flying machine as a military weapon.

¶ In the forthcoming mid-month September issue of the Scientific American, which will issue on September 14, these two subjects will be authoritatively discussed.

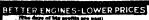
¶ Mr. Carl Dienstbach writes on the hydro-aeroplane. He points out how important is the development of the flying boat, because at last we have a vehicle of the air which is safe and which means much for the advancement of flying as a sport.

Major Bannerman Phillips of the British Army, a noted European authority on the military aspects of aviation, will write on bomb-dropping. He will show how much or how little is to be expected by dropping high explosives on an enemy's force from a height of half a mile, basing his comments on the achieve-ments of aerial grenadiers in the Tripolitan campaign and on the results of the bomb-dropping contest held in France.

¶ Dr. Alfred Zahm, America's leading authority on aero-me-chanics, will show in a popularly worded article what has been the development of laboratory work since the day of Langley. If the flying machine is to become a really practical vehicle of the air it must be developed by the same methods that have given us the giant bridges, the hugh dynamos, the highly ramified telephone. That is why Dr. Zahm's article, dealing as it does with investigations made by engineers and physicists, is of immense practical value.

There will also be the usual Scientific American featuresthe short pithy articles on current scientific events, with many bright illustrations of the latest inventions and scientific apparatus, the latest news for inventors.

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the year there is a scarcity of farm labor. To an American it is repuguant to see thirty or forty women working in a bee field under a man boss, but when h raises my question as to the fitness of it, he is quickly told that it is better for them than working in American factories in our large cities. Perhaps it is, be-cause for the most part they are young. strong Rohemian and Polish women who seem to have as much physical strength as a man But it is all contrary to the American conception of the sphere of woman, and if sugar beet culture cannot succeed in America without the general adoption of the use of women laborers, not likely to make any great prog ress, and we shall continue to import our

Germany's Gain in Exporting Sugar. German), with its annual export of 800,000 to 1,000,000 tons of sugar, worth ume of interputional trade, but is not los ume of international trace, but is not los-ing a penny's worth of plant food from the soil, because sugar is nothing but sumshine, water and carbon dioxide. On the other hand, the United States imports over \$100,000,000 of sugar every year, and exports cereals and cereal products to a value of over \$130,000,000. These cereals are all rich in the elements of plant food that come from the soil and determine the degree of fertility of the land. These elements, nitrogen, phosphoric acid and potash, have a stable market value at which they are sold in the form of commercial fertilizers. It is a simple matter of calculation to determine what it would cost to replace the plant food that we year through our export cereals and cereal-products, and estimating these on the most conservative basis it amounts to at least \$30,000,000

This certainly is wise economics from the standpoint of German agriculture, and so long as Germany can find a market for its sugar, they can well afford to im port the grains, mill-feeds and other concentrates, and thus build up their agriculture, but from the standpoint of the United States, we cannot afford to go on paying out over \$100,000,000 per year for supshine, water and carbon dioxide manufactured into the form of sugar

#### Germany's Interest in American Beet Sugar.

Since the beginning of the beet sugar industry in America, Germany has watched its development unxiously Many investigations have been made of it, and as much or more has been published in Germany concerning it as in America. consensus of opinion here seems that the one great obstacle to sugar beet production in America is the labor prob-lem. The fact that America does no have the cheap labor of Europe, and espe-cially that women are not used as field laborers, the Germans think is sufficient to keep the United States from becoming any serious competitor. But notwithstanding these handicaps, and the fact that the beet sugar industry has only been established in the United States about twenty years, we already produce one fourth as much beet sugar as Ger-many, and the production is constantly increasing.

The United States uses more suga than any other nation, and although only two other nations surpass it in the amount produced, Germany and Russia, than any other country in order to sup-ply our needs. Last year the importa-tions amounted to over two million tons, and in addition to this one and one half million tons were produced within our borders, including Hawaii and Porto Rico approximately one million tons being pr uced from sugar cane and one half mil lion from sugar beets.

We may increase our sugar produ as much as the total production of Ger many at the present time, and we will only be producing enough to supply our own consumption. Surely as far as the United States is concerned there is no great danger of lacking a market for all the sugar we may produce.

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August 17,

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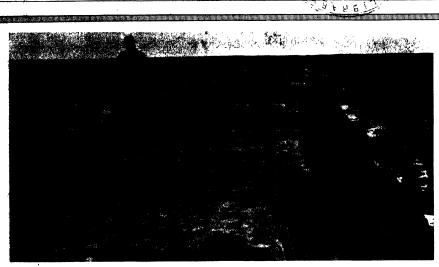
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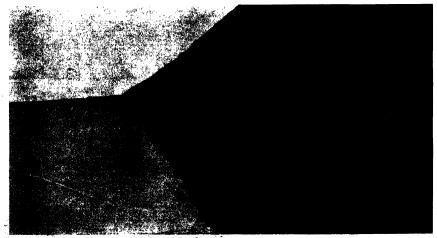
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NEW YORK, AUGUST 24, 1912

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The sum of \$2,900,000 was spent in constructing 9,250 feet of the Los Angeles breakwater. The mass of



The Log Angeles breakwater from the harber side. The wall is 11,480 feet long, 122 to 194 feet wide on ocean floor, 38 feet wide on the long of the lo

THE MARBORS OF THE .PACIFIC COAST .- [See page 100.]

## SCIENTIFIC AMERICAN

Founded 1848

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New YORK, SATURDAY, AUGUST 24, 1912

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Munn & Co., Inc., 361 Broadway, New York The bilitie is always gloid to receive for examination illustrated articles on subjects of timely interest. If the photographs are sometiment in the naticles short, and the facts outbrate the contributions will receive special attention. Accepted articles will be paid for all the contributions of the contributions of the contributions of the contributions. regular space rates

The purpose of this journal is to record accu-tely, simply, and interestingly, the world's rogress in scientific knowledge and industrial

#### Railway Speed and Safety

HE Public Service Commission, after investigat-HE Public Service colling the recent wreck of the Twentieth Century ling the recent wreck of the Twentieth Century Limited, found that the accident was due to the breaking of a rail, and that, though the rail was a way and equal to the strain to which fairly good one, it was not equal to the strain to which it was subjected under the high speed of this famous train. According to the report, the fastest express trains are running on "schedules too fast for safety;" and the commission recommends that the speed should be reduced with a view to easing up the burden which be reduced with a view to easing up the burden which is now imposed upon the tracks. In other words, in-stead of bringing the rails up to the speed, it is sug-gested that the speed be brought down to the rails. Now, this means that the rail manufacturers are to

be put in control of the whole situation; they are to manufacture the kind of rail which suits their particular whim, and then the speed is to be adjusted to whatever kind of product they care to turn out. Put in plain words, that is the exact situation; and if ever In plain words, that is the exact situation; and it ever there was a case of deliberate retrogression, it is to be found in this proposal to reduce speed. We are not for a moment disputing the broad wisdom of the sug-gestion made by the commission. On the contrary, we believe that the commission is correct in its statement notice that the commission is correct in its statement, that the present speeds are too high for the kind of rails over which it is being made. Until an absolutely reliable rail is produced, it would certainly be desdrable to ease up on the heavy strain to which the present rails are exposed, when the enormous engines which our fastest trains run at speeds of from sixty to eighty miles an hour

In the choice between high speed and good rails, however, it is assuming too much to suppose that it is impossible to produce a rail which will stand up under heavy, high-speed truffic. On the contrary, it understood by engineers that it is possible to produce such rails, and that the failure to secure them is en-tirely due to the rail makers. More than once, the SCIENTIFIC AMERICAN has gone deeply into this question, and we have shown that the deterioration is ralls is due entirely to the rejuctance of the rail mills to discard a sufficient percentage of the steel ingot, and to put into the rolling of the rail in the mills that time, cure and patience, which are necessary to secure an absolutely reliable product. When the steel has been cost into an ingot, preparatory to rolling it down into ralls, a large percentage of the steel is defective. Conscientions manufacture demands that the whole of this defective portion be cut away, and only the sound portion be sent on for heating and rolling. The engineers of the railroads, anxious to secure rails free from "pipes" (hidden, inciplent fractures on the rails) demand a large percentage of "discard" as it is called, asking sometimes for as much as twenty-five per cent ut the manufacturers, aiming at economy of time and labor, a cheap product, and large output, have always contested this demand of the engineers, and have made the discards just as small as they possibly dare to do

So powerful has been the influence of the manufacturers, many of whom are directly interested in and more or less control, the railroads, that they have conthreed to send out an inferior rail, and the result has been shown in the large number of accidents in the past few years, that are attributable to rails which have oken because of incipient pipes or fractures, hidd within the ratio.

The Public Nervice Commission is in favor of high speed under proper conditions; but it begins to look as though it realizes how all-powerful is the suffuseous of the manufacturers, and, therefore, despating of a sufficiently good rail, the commission has taken the only course open to secure safe travel, and has recommended that speed he reduced.

But high speed, under proper conditions, is one of the property of the property

But high speed, timer project conditions to the our-marks of progress; and it is too early in the day to acknowledge defeat and accept whatever the manufacturers are pleased to offer. A redesigning of the rail section, a better distribution of the metal in the various parts of the rail-head, web or base-a the various parts of the rail mean, we or one and a showing down of the rail mills to a speed which would insure a high quality in the steel, would give to the country a rail over which fast trains could run at high speed, without danger of derailment,

#### First Fruits of the "Titanic" Disaster

HE White Star Company, is to be commended for the promptitude with which it is putting into practice the lessons taught by the According to cable dispatches, the company is making radical changes in the underwater construc tion of its two largest vessels, the "Gigantic" and the "Olympic." The extensive and costly nature of this work may be judged from the fact that the total exis given as approximately a million and a half dollars. The outlay is large; but we believe that it will be more than compensated by the increased confidence of the public—a confidence which was rudely shaken by the sudden loss of the intest and finest of the ships that fly the White Star flag. For the past fifty years the white Star ships have been regarded (and very justly so) as among the most substantially constructed and best officered of the trans-Atlantic liners. The recent nest omeered or the trans-Atlantic liners. The recent disaster was charge-able more to the system under which modern ships have been built and operated than to any particular dellinquency on the part of the com-pany, whose vessel happened by the laws of chance to be the one selected to demonstrate how faulty that

Therefore, the prompt action of this famous line in taking steps to render its ships proof against such an accident as befell the "Titanic," is certain to restore confidence in the White Star Line and lead the way

conducte in the White Star Line and lead the way in a return to those principles of safe construction from which the art of shipbuilding had so widely departed. The changes in the "Gigantic," a slightly larger vested than the "Titanic," were foreshadowed by Mr. Ismay in his testimony before the Senate Investigating Committee. The "Gigantic" is now under construction at the Belfast yards, and the improvements will conat the neurast yarus, and the improvements will con-sist in extending the inner plating of the double bottom up the sides of the ship, to a point well above the dep-lond water line. We are not in possession of the di-tails; but in all probability this plating will be riveted upon the inner flanges of the heavy web frames, nearly upon the inner nanges of the newly web frames, nearly three feet in depth, which extend throughout the great-er part of the ship's length. In his testimony before the Lord Mersey investigation in London, Mr. Wilding, the chief naval architect of Messrx. Harland & Wolff, stated that there was an objection against such an inner skin, on the ground that it would be difficult to nner sain, on the ground that it would be difficult to inspect the inner surfaces of the plaining, and serious rusting might occur. The objection would be valid if the space between the skins were too narrow to admit a force of painters. But a width of there feet would give the necessary clearance, and it would be quite possible to provide manbloss, of suitable skin, through which a gang of men could enter to inspect and repaint the lutter or surfaces. the interior surfaces.

The changes to be made in the "Olympic" will be even more extensive and costly. They will involve an entire reconstruction of the boiler rooms. The present transverse bunkers will be removed, and new bunkers will be built stong the sides of the resset, the construction being similar to that of the "Mauretania" and other ships of her class. This will involve an en-tire re-arrangement of the bollers, which at present are fire re-arrangement of the bollem, which at present are placed five abreast, each battery extending entitledy across the ship. Probably the bollers will now be placed three abreast, which would leave sufficient room for longitudinal coal bunkers. The inner walls of the bunkers will form practically an inner skin to the ship, and any rupture of the outer skin would involve the Booding of mercely the relatively small bunker oun-

shoding of merely the relatively small bunker con-nartments in the neighborhood of the injury. The fact that this work has been undertaken by the White Star Company in advance of any legislation making it mandatory, is very significant; and it cap-not full to exert a powerful influence in hastening the forthcoming reforms in the construction of passenger ships. If the changes in the "Olympic" and the "dipantic" are to be made in association with a witer-tight steel deck, at of near the water line, it is not too much to say that the flar reseals will be practically much to say that the fine ressels will be practically unstikable by any conceivable disaster of the sea.

The Uniforthment with the Penny one who is at all the artists or an incomment of the Penny of medical and artists and artists and artists and artists and artists and artists of all emergency compressions, and that the investigations outerth to be no conducted that sary to maintain at great expense a check up the work of the Bureau, be

chack up the work of the investor, to its emission to assignification.

The Pure Food and Drugs Act, fit dies a piece of longitudino as Congress ever conceted, is findingled in romain ineffective because the load of the fideway of the control of effective administration of the Pure Food and Drous Act will the Bureau of Chessistry be in a fair, way of redeeming its shattered scientific resputation. It as autonishing to us that the prese throughout the country has failed to realize how farticel it is to have a Bureau of Chessistry and a Referee Bourd engaged is exactly the same worst, the doe veteramenty proclaiming its guardinaship of the public stometh, the other critically examining the facts by the rigorous methods of scien tific reasoning and experiment. In no other branch of title reasoning and experiment. In no other custure or the Government service, certainly in no branch in which actentifies work is conducted, is this anomaly to be found. The Bureau of Chemistry has the unserviable distinction of requiring supervision from an extransous body of experts. Like the suphomore clease at college, it needs the corraction of a faculty; and, as might be expected, conducts itself in a sophomoric way.

The situation must be intolerable to every man of real scientific instincts. Men who have conscientiously endeavored to ascertain whether or not certain inpredients in foods and drugs sold to the public are harmful or not, and who have been bold shough to voice their convictions in reports recommending that manufacturers be permitted to use these ingredients because of their harmless effect, have been treated as rescals. Men with little or no laboratory experience, who have prepared what may be called cooked-up evi-dence of fraud and toxicity have been praised and advanced, even though the courts have ultimately decided against them.

cuced against them.

The daily press has halled with euthusiasm the appointment as head of the Bureau of Chemistry of a man whose past career holds out no promise for future reform in the methods of administering the Pure Food and Drugs Act. A graduate of an agricultural Food and Drugs Act. A graduate of an agricultural college in the Middle West, he has here published any scientific work of importance; nor has he pursued any graduate studies. The relation of physiology to the Pure Food Law is a sesied book to him. Far better would it have been if an intelligent civilian with an open mind were appointed.

Alsa, for the Pure Food Law! Manufactures who have money exough to fight in the courts and to engage experts at high market prices will continue to flue first the pains of indigestion, contracted because of the Burseuris inspitting, with medicines whose sale the Burseuris

ineptitude, with medicines whose sale the Bureau ought prevent. If "muck-raking" were still journalistically shionable what a sensation the exposure of the conditions in the Bureau of Chemistry would en

The International Institute of Agriculture.—M. Louis Dop, the French deliquet to the International Institute of Agriculture in Rome, and vice-president of the Institute, held-published a pamplett reviewing the history of this remarkship body, and predicting the lines of its future development. Fifty countries now athere to the convention of 100, and contribute a total convention of 100, and contribute a total convention of 100 and 100 of \$100,000 e year to the manifestance of the Institute; which is high of Indy, manifestance of the Institute; high of Indy, and high size of Indy, the Indy of Indy, the Indian is the Institute and Indian in Indian is the Indian Indi of \$100,000 s year to the maintenance of the Insti

#### Blechdelte

desired threat Lamps in Oldenje.—Chicago has deathed to substitute 50-wate Tungston lamps for the gas diversi famps it now seen. The gas lamp posts are being assisted shaded to receive the electric lamp. Over the thorough Tungston lamps are to be installed.

All Subsemelle Watter.—An Australian has invented an sinericit waiter for hotels and resistants, operated by the gustemer seated at his table. A wooden frame holding the menu eard is fitted with push buttons opposite seek ities, and "presenting the button" tings a bull in the hisbins and displays the order and the table number. The hitches appeares as loop rints a cheek the original of which comes to the customer, with a duplicate on an end-manage. This device has been in successful use in New Section 1.

Wassum Cleaning Extraordinary.—A machine combining two modern inventions, the electric car and the vacuum cleaning apparatus, has been applied in Strassburg to clean the trauway tracks of that city. In the operation of the machine the roadbed is aprayed with water, then the dirt is lossessed by a scratcher and drawn up into the car by the sustion apparatus. With this machine one man can clean 25 miles of tracks a day, replacing the labor of 17 men working in the ordinary

Esectrical Transmission of Small Water Powers.— The present day is use of very large hydro-electric transmission schemes, but in France small water powers have been smoosenfully utilised. A typical rural hydro-electic scheme is that of Cotentia, on the banks of the river Saire. In this installation the energy in the fall, only 15 to 20 horse-power, is transmitted over a maximum distance of 4½ miles. During the day the output of the generating plant is utilised to run dairy machinery, and a night the outrent is switched on to lighting croutts.

as night the ourrent is switched on to lighting or Flashing Sign for Autoruck.—The large number of electrically propelled trucks now in use has suggested the disas of equipping these trucks with electric finishing signs. This has been tried out and has proved very effective, an automatic finable is used which will change the color of the sign with each flash. The name or trade-mark is outlined with electric lamps and the sign is flashed out as frequent intervals in red, pink, white and green lights. The effect is very pleasing making the adventisement correspondingly valuable.

Improved Mothed of Lifting Pig Iron with a Magnet. It is quite a common practice to use lifting magnets for handling furnase pig iron. Untailly the pigs are stacked horisontally and not many of them can be lifted at a time because a relatively small number can be brought into contact with the magnet. Someone has recently hit upon the idea of stacking the pigs vertically, so that the face of the magnet will bouch a greater number of pigs. It has been found that by this method, the lifting capacity of a magnet which heretofore was able to raise only 1,000 pounds of pig iron was increased to 2,000 pounds of pig iron was increased to 2,000 pounds

Reflecting Power of Wall Papers.—The surface brightness of walls or estings lighted by daylight or artificial light is now determined directly by an improved portable apparatus for measuring illumination and known as the "holophane limester." Tests of various wall papers in rooms lit by tungeten lamps showed that a surface brightness of 0.3 foot-candles is usually necessary to give the room a obserful appearance. Eight blue, dark red, deep green, and very deep blue wall papers showed surface brightness varying from 0.3 foot-candles for the fart mentioned to 0.05 foot-candles for the last mentioned, with corresponding reflecting powers varying from 40 per ent to 4.5 per cent

Shorthaul Electric Track Service.—An excollent illustation of the value of the electric trauk for short haul is cited by the Electrical Review and Western Electrician. In a certain large mill a boiler plant is located about a hundred yards from the coal storage yard. The tuel used to be handed by wheelbarrows, but an electric track measuran learning of this work, made an investigation of its cost and cannot to the constitution it could be done more cooliminally by the use of a motor-driven truck. A storage battley truck was purchased and it soon, proved its economic, A single man was required to operate the truck, his work insulating the localing as well as the distributes of the truck.

operator too-treet, a voter, measure to toming a very contract to the trained.

Hand-driven Generative for Whoslast Teiengraphy—
The United States Highest Coppe has developed a new
form of generator for the with its portfallow virieless toigastly selve. It is conside of a small generator, the rotor of
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#### Sleiene

Cape Deshaef.—The extreme northeastern corner of data is still called "East Cape" in many atlases and other geographical works. The Bulletin of the American Geographical Bootety calls attention to the fact that the name of this point was changed to "Cape Deshaef" in 1898 by command of the Emperor of Russia, in honor of the explorer who discovered it.

Surveying with the Camera.—The first extensive use of the panoranis camera to supplement the plane-table in surveying is said to have been that made by Mr. J. W. Bagley, of the U. S. Geological Survey, in mapping an area of 109 quates miles around Valdez, Alaska, during the season of 1911. This method promises to become a regular feature of the Survey's work in Alasto.

The Twelfth International Congress of Geologists met at Toronto, Canada this week. Among the special subjects for discussion were the world's coal supply, and interglacial periods. Twelve securisions of from one to twelve days took place before the meeting, and at on from four to twenty-three days after it; some of the latter extending to the Pacific Ocean and the Klondike.

Fixing Atmospheric Nitrogen in Iceland.—Thoriakhave, the best natural harbor on the south coast of Iceland, has been sequired by a French company, along with neighboring waterfalls yielding about 200,000 horse-power, and a plant will be creeted at this place for manufacturing artificial saltpeter by the utilization of atmospheric nitrogen, according to the Birkeland-Eyde process.

Numbering Street Car Lines.—The names of street on a lines are usually a source of perspective to new services in a city, and the confusion is often increased rather than mitigated by the signs on the care. A consular report from Amsterdam tells us that in that city the convenient plan has been adopted of giving coach car line a number. This number is suspended in visible several hundred yards away. The numbers are always referred to in directing inquires. Most German cities have a similar system, which works very successfully.

A Rhise Museum is soon to be founded at Kohlenz, if present plans are carried out. It will include a large collection of charts, pictures, models and diagrams illustrating the physical conditions, past and present, of the famous river, and a complete exportion or its economic history. Some of the unique features will be: Models of the various types of vessel used on the Rhine from early times to the present; models of past and present bridges; illustrations of the methods and apparatus used in maintaining and improving the navigability of the river. A fine series of geological models is contamplated. The city of Kohlenz has already given a site for the building.

Spitzbargen as a Scientific Praserva.—Diplomation negotiations regarding Spitzbargen, now in progress, contemplate the unique plan of setting asside the far contemplate the unique plan of setting asside the far resident setting asside the far setting to the plan, no land on hereafter be acquired in Spitzbargen except for purely scientific or humanitarian purposes, and the further expicitation of land already in the possession of commercial organizations (mines, faberies, etc.), will be placed under such restrictions as will ensure the preservation of the flors and fauna. The hunting of fox, polar bear, walrus and reindeer will be prohibited from May 1st to September 15th. The hunting of elder-duck will be prohibited entirely, as also the use of poisons and explosives in faihing.

The Pittsburgh Smeke investigation.—The Department of Industrial Research at the University of Pittsburgh has published the first of a series of buildings on the investigation of the "mucke nusance," for which funds were provided on a numificant scale by a Pittsburgh business man. The investigation is being carried on by a staff of treasty-five specialists, as, of whom give their entire time to the work, while the others have been intentied with the preparation of reports on special phases of the subject. The topics discussed briefly in the initial building and the properties of the physical Scott, The Chesintery of Smoke and Scot; The Chesintery of Smoke and Disease; What the Smokes Nutsance Costs; Who Makes the Smokes Publishment of Smokes; Description of Buildings and Publishment of Smokes; Smoke Manna Weste and Indiance Control of Disease; What the Smokes Nutsance Costs; Who Makes the Smokes Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes Costs; Who Makes the Smokes Substance Costs; Who Makes the Smokes

#### Automobiles

\$80,000,000 Invested in Electric Vahicles.—According to statistics collected by T. C. Martin, churman of the committee on progress to the National Electric Light Convention at Seattle, researtly, there are a present invested no less than \$80,000,000 in electric vehicles, of which sum about \$25,000,000 perpresents the outlay for trucks and delivery vehicles, and \$55,000,000 the value of pleasure cars.

Huge Racing Car Coming.— A specially built, 300 horse-power Benz racing car soon will make its appreasion in America. The act is said to have been purchased by a well-known race promoter and will probably be driven by Robert Burman, holder of the world's record for straight-away speeding, in an endeavor to lower his own record of 25 seconds for the mile. The car is reported to have made a mile in 21 seconds, or almost three miles a minute.

Vellowstone Park and Automobiles—Representative Rancker has petitioned the United States (Overminent to open Yellowstone Park to automobiles. This famous park is still closed to motorisk, and it is claumed that the is no valid reason why it should remain so. The present is no valid reason why it should remain so. The present of the period of the peri

Motorist Poisons Fish by Carbide.—An American tourist had a peculiar experience recently in Southern Bavaria. Passing by a small stream, after a long trip, he stopped his car to empty the old carbide from his acety-line generator and refill it. A few days late the received a note from the supervisor of the county, notifying him of, a suit for damages entered against his for possoning the fish in the river with carbide. It seems that the part of the river had just been stocked with bass, and many had been killed by the gases developed by the carbide residue.

Leadon Introduces "Reversible Omalbus."—Breaue of the narrow streets in several parts of the city of 1-on-don it has been found impossible to use the ordinary motor omnibus on account of its comparative length and the attending difficulties of turning the bus around at the end of a trip. Some of the routes laid out for the motor buses are circular, thereby obvaiting the necessity for making complete turns. On some occasions it has been found impossible to map out circular routes, and an upper of bus is being tried out, which is reversible, the same as a trolley car. It can be attered from either end, conductor and driver simply changing places.

University Establishes Automobile Science Course.— The first university in this country to recognize the importance of the motor car and to place it on an equal footing with the building of bridges, railroads and tunnels, with chemistry and other sciences, is the University of Southern Californa. The new course is for the benefit of automobile mechanics, engineers and designers, and the first professor of automobile searce as Stanley Finish, C.E., who has just been appointed to the chair While he will deliver lectures on the various subjects properly belonging to a unimobile searce, he will speasifie on motors and their efficiency, sliding, poppet and rotary valve types, etc.

Military Exemption for French Motorists.—For the purpose of facilitating the transportation of the general staff in case of war, the French military authorities have desided to give those who own cars of medium horse-power, and who are able to prove their ability of driving them and taking care of them as far as tires and ordinary road repairs are concerned, a special opportunity to discharge their military duties in an agreeable transer, instead of being compelled to drill with the other conscripts, such owners must sign an agreeable transer, instead of being compelled to drill with the other conscripts, and owners must sign an agreement with the authorities that they will turn over to the government immediately following mobilization the vehicle described in their application for this sort of service. At all maneuvers the car must be at the service of the military authorities, to be driven by the owner himself under orders from the officers.

Mysterious Fire from Odd Cause — A Gruman motinist the other day discovered the most extraordinary cause of a fire starting in the carburster of his automobile that has ever been brought to public notice. Noticing a leak in his carburster connections, he stopped the car in a completely described read in full smilker! There was no spark, fire, match, broken insulation, or any other thing state could possibly have caused the gasoline to earth fire; yet in a few moments the carburster was ablaze. Luckly the motorist was something of a scientist and he started on an investigation of the "why and wherefore"— after had managed to extinguish the fire. To his surprise he discovered that the catch on the convex front less of the beddight had become unfastened and the lens had swung around in such a manner that the sun's rays became focused directly on the leaky connection at the earburster; a highly effective burning glass leing thus responsible for the "inexplueble" blaze.



The Burgess-Wright off on a reconnais-

## The Aeroplane in the Military Maneuvers

The War Operations in Connecticut Clearly Point to the Necessity of Having a Large Well Trained Corps of Aerial Scouts in Our Army, Equipped With Machines Capable of Rising from Unfavorable Ground With Two or More Occupants



Lieuts. Milling and Foulois in the Curties

N 0 doubt the most important feature of the minute N 0 doubt the mixth of connecticut has been the scotting of the station squadron. This is the first time that neroplanes have played an important part in ambiliary manuevers in this country, and their work has been exceedingly gratifying. After the region in which it was decided to hold the manuever had been selected, it was gone over very carefully to find a suitable field from which the movements of the troops could be directed and where the according squadron could have the headquarters in this cuttive territory of 240 square

directed and where the accordance squadron could have the headquarters in this cuttle territory of 20 square nalies, only one sjot was found where there was a stretch of three hundred yards prac-tically level and untimbered. Here the headquarters was cotabilished and the field was prepared to permit of hundridge accordance. The endineeting corps worked for a day dynamiting the rocks and suc-ceeded in clearing one hundred and fifty yards near the southern end of the field. To the south of the field was a heavily wooded tract, while the north end was closed by a low stone wall. The field was so narrow that the aviators were compelled to start always toward the north regardless of the direction of the This made it particularly difficult because the prevailing winds were at the back of the aviators. Owing to these conditions it was next to impossible to launch achine with two passengers. aviation squad, there were two machines belonging to the regulars and one machine of the New York National Guards The of the New York Sational Guards. The latter was a Curtiss machine, piloted by Private B Havens. It was equipped with a 75 horse power engine, but its wing spread was not great enough to permit of launching the aeroplane under the un-favorable conditions with a passenger. Consequently, the pilot had to go aloft alone and make his own observations. Not being a trained scout, he found great difficulty in observing the armies, and could not distinguish between the various could not distinguish between the various bodies. The Curliss machine of the United States Army was piloted by First Lieut. T. Dew Milling of the Fifteenth Cavalry. This machine was also found to have too small a wing spread to lift, two men off the ground from the field at Paradise Green. The attempt was made at one time and it came very near to resulting disastronaly. With Lieut, Milling was the lighttest member of the aviation squad, Lieut, Geiger. The wind be-dind the aeroplane drove the machine along no rapidly that if reached the end of the field before it could lift licelf more than a few feet off the ground. Both occupants of the machine thought that they were doomed, but they succeeded in just clearing the threefoot stone wall but a few inches. They also narrowly excuped collision with the woods at the end of the next field. So narrow was their except that it was decided to make no further attempt at carrying a passenger until wing extendance could be secured.

The wireless apparatus on the Burgess-Wright.

Note the telegraph key at the extreme right of the picture



Curtiss acroplane clearing the stone-wall

The other regular army machine is a Burgess-Wright.
Although furnished with an engine of but 50 horsepower, and capable of making but forty miles per bour,
this machine had no difficulty in rising from the field.
But Pilot Lieut. B. D. Foulois had equipped it with a
wriceless telegraph apparatus, the weight and disposition of which made it impossible to carry a passenger.
Two other machines which were to have been on hand
for the manesuvers were injured on their way to the
field. One of these, a hydro-aeropiane, was wrecked
in Plymouth Harbor. This was very unfortunate because there would have been a good opportunity to
hunch a machine from any desired point
on the Houssinoid liver against the wind,

luuch a machine from any desired point on the Housatonic River against the wind, regardless of the direction in which it was blowing, and with a passenger, the observations made would undoubtedly have been much more complete than was possible with the pilot flying alone.

During the first hair of the maneuvers the aeroplane square was neutral, and was required to report the position and movements of troops on both addes. A problem would be assigned to the avlation squadron requiring it to make a reconsistency of the square of the avlation squadron requiring it to make a reconsistency of the square of which were given. The instructions were made somewhat ambiguous, so as to test the intelligence of the men. For instance, on August 12th the order was given that 'the triangle, Riratford, Derby, and Long Hill, be examined for the location, composition, and strength of the military forces covered therein, results being reported at headquarters, as soon as practicable. On up to midnight the squadron pored over the map, studying caractily it herritory and trying to make mental pictures of it. It was found that there were two Long Hills, but one of them was eliminated, because it may practically in a line with the other two points. It was assumed, therefore, that the other Long Hills must be the one referred to, even though it was not so promisioned the map. Their it was not the map. Their it was not promisioned to the map. Their it was not promisioned to the map. Their it was not promisioned the map. Their its man to so promisioned the map and the map.

reasoning proved correct.

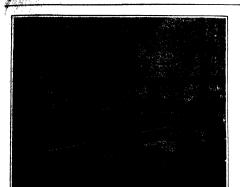
The aviation regulations required that they carry registering barographs and wrist aneroids. They were required to fly

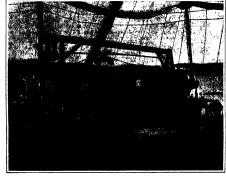


The wireless station at headquarters.



The generating out of the Wireless station.





A view of several of the sections within the tent.

Demonstration of the electrically operated hay unloader.

## Teaching the Farmer How to Use Electricity

A Circus Tent Display of Farm Apparatus by a Central Station Company

By Thomas Commerford Martin

Fig. 8 mome years past the machinists and electrical manufacturers of the country have been going through an eleborate process of adapting the machine tool and the electric motor to each other, whether for belt or for direct drive; and the development in this important field of industry may at last be regarded as fairly complete; for there is literally no art into which electric power has not now made its way. Indeed, in many branches of production it is already the leading source of energy. This chapter of electrical libitory succeeded that of the trolley, which in turn devolved from the electric lighting period; and the results of all these epochs are to-day converging upon the efforts that electricity is making to win for itself one of the oldest domains of human endeavor—agriculture. Thanks to the ever-progressive polley of this journal, the readers of the Normarrus America and the America is the very large properties of the equivalent and the farmer. It is certainly significant of coming and the Zamer. It is certainly significant of coming and the Zamer.

presented to the United States Department of Agriculture for study; that the United States Bureau of the Census is seriously considering matching it a special part of the electrical consus of 1912; and that both the American Institute of Electrical Engineers and the National Electric Light Association are making if the tools of from the american constitute or the constitute product and the second of the constitute product and the second of the second the second of the second the

the American institute of Emerican and insignments and the topic of frequent papers and committee reports. All this new linterest, attualized of course by the high cost of living, the "back to the farm" sentiment, and the greater wealth of rural communities, has been due largely to the fact that the new power transmission systems, looking for a market for their current, are themselves unavoidably throwing a network of circults over wast agricultrant regions, so that in reality the market sought lies immediately around them. Relatively few farmers can afford to pair in generating plants of their own, but when the aerial tracks for lighting supply rur light by their doors, it is easy and cheep to tap them for even a very small local consumption. This is what is more going on over large areas particularly in the Word and on the Pucilic Count, but there is another extremely lineredship as pect of the matter to which the present article draws attention. The edy central stadion systems once

limited to small urban districts have expanded into the outleting regions to such a degree that where they formerly served but a few squares miles of territory they now embrace hundreds. Thus the North Shore lines forming an outer ring to the Chicago system with which they are "tied in," are already supplying electricity in a region of 1,200 squares miles with seventy-one towns and villages, and the oil Boston Edison (Company, not long any centered tightly around the famous Tea Wharf, operates actively in a principality on far short of 700 square miles. This district, while every populous, is also decidedly rural, with heaven alone knows how many farms and market gardens in it, and hence we find the company, in a highly official way, making a strong logs for the furnary parton age. Within Boston it has been spending ever \$100,000 a year in publicity to exploit the electric vehicle, and now with proteam eversatility, it is spending probably an equal sum in trying to electrify the countryside. Such enterprise and lingentify as are being displayed would seem likely to enjoy a rich reward; at any rate it is only in this manner that the thing can be given a real test.

real test.
One of the great problems, of course, in introducing



Exterior view of the tent showing electric farm trucks.



A corner of the workshop section.



Standing at attention at milking time.

A Charles of the Control of the Cont



The wood splitter in operation,

2. december of the second seco

destricul farm apparatus is that of reaching the pros pective customer, rather remote from factories and tores and hard to convince by even the cleverest adver-The "prospect" tising and literature vn that it is to his benefit to adopt the innovation, and even then will be louthe to invest. In one or two and even then will be located by been company has almed to meet the question by buying a farm in the heart of a likely district and operating it on an electrical basis, so that the neighboring folk can see for themselves how it works out. This is a slow sthod, and, besides, very often a farmer does not want, or need, to electrify his whole farm, but prefers to get some special appliance of a particular make. The plan of the Boston Edison Company has, there-fore, been to invade its rural territories with a live demonstration, and to move the show from place to place, so that the whole population within the beltsay 750,000 people—can be convinced, the old farmers converted, and lots of citizens hungry for farm life shown that it is feasible for them, shorn of its wonted

It is thus a traveling circus that the company has in operation, and the novelty of that feature alone helps to attract visitors. The number of practically interested people inspecting it has averaged about 100 interested people inspecting it has averaged about 100 a day right along, to say nothing of any number of persons and children lured by mere curiodity; but even they are not to be deeplesed. With an occasional band of music and the regular plate henomade concomitants, the "Circus Farm," when in full operation is a fair rival of the sawdust ring as an am altogether uside from the fact that it is giving in struction, and has airendy set the wits working of many a shrewd and inventive observer, who sees at many a survey and inventive sossever, we seek aconec that here are new tides and phenomena in the shaping of which he may play a part, as applied to the greatest and oldest industries. The Circus Farm is a big cauras (ent, 60 b) 100 feet, under which is housed a grouping of some forty large pieces of apparatus. ratus and farming tools, supplemented by forty ordinary and smaller appliances. All the appa ratus is ready for use, and runs, and demonstrates its economic service on the farm. Each appliance is plainty marked with its name, the manufacturer, its price, and the cost of operation. The price is retail and includes the muchine, its motor and everything read) for actual service on the farm. Some machines and tools have been omitted from the exhibition beand roots have been conficed from the exhibition be-cause they have been regarded as unpracticultie— least for use in New Eugland territory. Others are not shown because it has not been possible to "stand-ardise" them, that is, furnish them to the purchaser with "everything all on" ready for operation.

For the first five weeks the farm was located on the Old Middlesox South Fair Grounds in suburban South Framingham, easily reached by the electric car lines. The main poles of the tent are surmounted with pennants and in front of the main entrance have been placed three large canvas display signs in strik-ing colors to add some of the "drawing" effect of a high-class circus. The scheme has proved effective A broad, main passageway extends down the center of the tent from end to end. On either side are the work-ing exhibits protected from the visiting throng by railings. The tent is brilliantly lighted at night with 500 watt incandescent lamps, and the outside grounds are made brilliant with luminous ares.

Two electric trucks, one of two-ton capacity and another of 700-pound capacity, are used in connection with the farm for hauling material to and fro. A spe-cial feature of the truck service has been in demonstra-tions to the neighboring farmers. Wherever the farmshown an interest in the truck proposition, the vehicle suited to the service has been sent out to haul loads around on the farm. From time to time material has been carried from farms into town, or vice versa. The result has been that many of the farmers have now practical knowledge of the working efficiency of an electric truck on the farm, and are considering

The farm is equipped with a motor on a portable truck, which can be moved from place to place and con-nected up with any piece of apparatus. This shows, of course, the practicability of portable electric power

The milking tests prove very attractive to the reand there is always a crowd at the evening milking time. Practical milking demonstrations have been given at large nearby dairy farms, to the great satis-faction of dairymen. The farm is resulting in excellent business, and many of the purchases of ele appliances are traceable directly to the inspiration and information gained there.

Obviously, there were many incidental difficulties in carrying out this ingenious scheme, but with a supply of power always at hand from its own circuits, the company has been able to meet them Like all circuses moving from point to point, the question of transpor-tation has to be dealt with, but here the electric truck has a great change to prove itself under genuine coun

try conditions. In order to keep the circus going try collations. In order to keep the circum satisfactly, the company has two tents, so that the next site can be selected and one tent set up before the existing circum is moved on and the other tent taken down. Hence, the apparatus has its home awaiting it, is protected from undue exposure, and can at once hitch to the waiting circuits.
In addition to this "Circus" or "County Fair

in against to the work, the Boston Edison Company has worked out a kindred idea in its "Edison House," which aims to show the farmer or the suburbanite how electricity can also be utilized indoors as well as out. This model dwelling is portable, and is moved from village to village, being set up in each place with appropriate and pretty floral surroundings It is always put in charge of some local woman of intelligence, and all the women's sewing bees and local clubs can make use of tit—which they do freely. Kitchen, living room, cellar, dining room, bedroom, porch, woodshed, are all equipped thoroughly, and it is difficult to think of any estic operation that is not here shown under full electrical conditions. It is inevitable that such mis sionary work should tell in the long run, and that this way, with the aid of electricity, the farmer's life will be made more endurable, more inviting, more profitable. Edison has said that hoeing corn is, from his experience, one reason why large cities exist. Here are reasons why people will not go back to the farm, because they will never leave it.

## A Forest Service Circular on Quebracho Wood

IN response to frequent requests received by the United States Forest Service for information relative to quecho wood, its uses and substitutes, a short cir has been prepared. Quebracho, an Argentine wood, is very important for the tannin it contains and a need is keenly felt for fuller information regarding it, based a scientific study of its structural characters. upon a setentiar study of its attructural caracters. In general apparance the wood is scarcely distinguishable from two other Argentine woods called white quebracho and red quebracho, which yield tannin in a much amaller quantity. A study of the chief distinguishing characters quantity. A study of the enset distinguishing characters of true quebrache and these two possible substitutes will prove very helpful in detecting the inferior kinds when they are mixed in with the genuine.

The indistrininate use of the name quobracho has resulted in much confusion, which called for a discussion

in order to clear up the nomenclature of the different woods referred to under this vernacular name. The circular is not a treatise descriptive of the many species of tropical and subtropical woods now known as quebracho, but it is devoted chiefly to a discussion of the distribuon, supply, uses, and importation of true quebracho into the United States. Perhaps the most valuable por-tion of the circular is a clear detailed statement as to how the true quebracho can be distinguished from its substi-In a discussion of this kind so many unfamiliar terms are generally employed that the lay reader will not be attracted. The aim of the authors has been to substitute the simplest terms in the discussion of those parts of the wood and its uses which are most likely to be of st and importance to the general reader and f quebrache wood. In this the authors have successful and the subject is treated in an untechnical and popular, yet accurate, manne

This study on the structural characters of true que bracho and the spurious kinds, affords an interesting illustration as to how apparently similar woods may be mustration as to now apparently similar woods may be easily distinguished by means of a simple poolet magnifier or a compound microscope. Well selected photographs of magnified transverse and longitudinal sections have been included for the purpose of illustrating more have been included for the purpose of illustrating more clearly in what respects these woods differ.

#### Uses for Useless Metals

An immense fortune, according to economic geolo tellurium. This mineral is one of the by-products of copper refineries and of plants working up gold telluride ores. At present it is all thrown away, as it is absoide ores. At present it is all timown away, as it is abso-lutely no good to anybody. Only a few years ago tungsten was in very much the same position as tel-lurium is now. Then it was found to be highly useful in the manufacture of incandescent lamps and tool steel, till to-day it would seem probable that with a cheaper supply it will become one of our most im-portant minor metals. Selenium is another substance which has just come into its own. Up to a year or two ago no commercially important use for selenium two ago no commercially important use for selection was known, although for some three or four years it was one of the ingredients entering into a secret process in the glass industry. It is now well known among scientists that selenium is an agent in coloring glass red, and in decolorising glass by the use of small amounts to neutralise the green of ferrops iron. A French scientist has also utilised it in an invention by which pictures may be transmitted by with. Iske tellurium, selenium is a by-product derived from the refining of comer. Autoroutly about twenty tons a refining of copper. Apparently about twenty tons a year are now utilised commercially.

The Automatic West's

THE Dunders of an incipret prescriber, regarded as blunders merely, do not at first sight, one much scope for agreeable meditation, either to their perpetuator or to other people. But repeated as jibsnown, physical and mental, they are found to be moseum, parsure and mental, they are required to most only interesting matter for stage, but splineline contributions to science and scholarship. Fig. 1s. stead of being the mere accidents of careless at away ward ingers, they are really the product of psychologic

ward fingers, they are really the product of psychological law, and the creators of a new vocabulary.

There is, for instance, the proposalty to wribe, as instant wide over. The finger receives an order to bouch a certain key, and responde with twice the could be considered to the control of the control o

nmerson speaks, who, when he are said a good thing, straightwar says it over again.

A modification of the same action is that of fellow-ing a capital with the corresponding small letter, as Corek, Rrome. One wonders if Aeron, Lloyd and their like might have originated in an analogous way.

Again, when a double letter is called for, the order often seems to have been minunderstood, and the wrong letter is doubled, as look for look, or fast for

Still more singular is the tendency to anticipate in word a letter belonging in the next, as lash week for last week.

The most surprising and amusing effects of all are use produced with machines having "shift-keys" for those produc capitals and figures, when one pushes the wrong lever, and having ratifed off what he believed to be the word EDUCATION, sees in its place 3\$772589, or, intending to date a letter 1910, reads QOQP.

In all these blunders except the last it is easy to detect the principle of the time-element in volition. The operator usually foresees the mistake before it ide, but is unable to prevent it. He knows that he has directed the finger toward the wrong key; but he is unable to recall the order and issue the correct one in its place in time to prevent the result. The persists in its course in defiance of its o will, finds the key to which he had originally directed it, and prints the obnoxious letter in spite of him. This is one of the commonest and most surprising of his experiences. It is also one of the most interest psychological point of view.

But the psychological result is not the only one accruing from this process. The verbal product is also striking and significant. Along with all this irseemingly haphasard mental action, th regular and seemingly napassard mental action, there embrages an original vocabulary, surprisingly copious and interesting. The typewriter is a prolific creator of new words. Besides the frequent substitution of one regular dictionary word for another, and the pro-duction of confused combinations that are not words at all, it turns out a multitude of words that are formed, pronounceable, and even euphoneous, but which no lexicographer ever heard of

The writer has for many years been in the habit of setting down these machine-made words, as they spelled themselves out under his eyes, until there has accumulated a vocabulary large enough to furnish some new-born nation with the nucleus of a language. From between two and three hundred that have been preserved, not one of them intentionally produce the following one hundred will serve as examples:

ablo	dera	het	neen	#00ZD
action	dinf	huse	newa	BD072
af	efaf	ir	nive	stry
agarm	epon	id	ond	stane
ang	ew	ite	ot	stoct
aming	ferly	impuse	ovet	SUE
agrice	fing	inti	parton	tere
RGBR	first	fud	persol	ther
attan	fird	kint	DOSD	trem
bak	firt	kep	privare	truit
begil	foing	leson	ract	ud
bereen	fot	Hbarm	repor	urd
bome	fron.	-lokk	rhe	vety
ORDO	gollen '		ruter	walg
ciré	goom	mant	36-VOOF	Wate
00086	greet	mete	ecrim	WAW
ore	hace	minf	sevonid	whid
Heat	hald	mosy	secion .	whix
depene	havet	-200	shoy	yout
detiture	hele	and	eme	
CONTRACT O	There's	MAIL	AIME	yoy

This is but part of the product of a single This is but part of the product of a single type writer, and very constantly used. Every ones of these works, and handreds buildes, were absolutely not contain the product and handreds buildes, were absolutely not contain the product of the myring over, from leven times, and id and of dev times said. Could we said to the list the product of the myring of other manifesses, each, no would, depart the shift of the single expert in mostal, facilities the shift of the single expert in most in most the shift for the single expert in the containing oversion, we should have measured for given unabridged dictionary and a new language. A mackine for the production of a set of new ideas to fit these unappropriated deepes in next in chief,

## Corresunndence (The editors are not responsible for states and in the correspondence column. Anonymous

of he poweldered. but the names

#### Paraffine for the Obstinate Collar Button

To the Editor of the Scientific Austicative To the Editor of the Scientific, the present collar button works perfectly well if the back of the buttonhole is rubbed with parasitine. A pin, too, if rubbed with parasitine, passes through starbold linen "like greased lighting through a barberty bush."

W. S. B. Genessen, N. Y.

#### A Card Trick

To the Editor of the SCIENTIFIC AMERICAN:

This is an old favorite this side. It was taught me by an old eavalryman more than fifty years ago. His formula was: "Eight kings threatened to save min fair queens for one sick knave." This, in my experience, rather more mystifies the beholders than that of "Regu-lar Reader," on page fifty-five of your issue of July 20th. London, W. C. E. J. KIBBANVITE

Editor English Mechanic.

#### An Engineer's View of the Patent Bills

To the Editor of the SCIENTIFIC AMERICAN:

To the Editor of the Scientific American:
Please allow me to thank you, as an inventor, for
the sphendid article in issue of August 3rd, 1912, regarding the Oldfied Patent Bill. If you only knew how
many inventors need a champion like you I am suryou would feel well repaid. The plain word you use
should appeal even to a Congressman. The Government is a plain swindler when it grants us the exclusive
right to make, use and vend our inventions, after taking money, as it does not attempt to make its word d. CLAUDE L. HAGEN.

San Francisco, Cal.

#### The Automatic Stop on Railroads

To the Editor of the Scientific American:
The recent disastrous wreck on the Leckawanna at The recent disastrous wreek on the Lackawanns at Gibson seems to be only another of the aircady many and grawsome arguments in favor of the adoption of some form of automatic stop in connection with the block signals. Under present conditions the more fact that a signal does its work properly is no guarantee that the danger will be avoided, since so much is left to the "human element." Rain, siect, snow and fog are factore to be condidered and have time and signi proved the inadequacy of even the most perfect block system. The automatic stop is not new, having been tried and found successful under certain conditions of city traffic, and its general adoption for main line railroad work and its general adoption for main line railroad work would not only be an added asfeguard to passengers, but moreover would undoubtedly pay for itself in reducing such costly accidents as the recent Fourth

This letter is written in the hope that you will take up in your editorials the question of automatic stops, a measure which seems to be only too urgently needed

amoustre winon seems to be only too urgently needed under the present conditions of fast passenger service. Sangerfield, N. Y. WILLIAM CARY SANGER, Jz. [This matter formed the subject of an editorial in our issue of July 20th.—Reprox |

#### The Nut Problem

To the Editor of the SCIENTIFIC AMERICAN: General solution for any number of men, s, and any number of monkeys, m, less than n.

Let a = number of nuts in last quotient.

Let  $\sigma$  = number of nuts in last quotient.

y = number of nuts originally.

It is evident that we can pass from  $\sigma$  to y by multiplying  $\sigma$  by  $\pi$ , and then performing,  $\pi$  three in succession, a cycle of operations consisting of multiplying by

$$\frac{n}{n-1} \text{ and adding m.}$$

$$\frac{n}{\text{Therefore,}}$$

$$y = \frac{n^{n}}{(n-1)^{n}} z + m \left(\frac{n}{n-1}\right)^{n-1} + m \left(\frac{n}{n-1}\right)^{n-1$$

$$\frac{n^{n-1}}{(n-1)^n} x + m \frac{n^n - (n-1)^n}{(n-1)^n}$$

$$\frac{n^n - n^n}{(n-1)^n} \left[ nx + m (n-1) \right] - m (n-1)$$

$$nx + m (n-1) - m$$
must evidently be integral = z, say (4)

must evidently be integral == z, say (4)

(n-1)\*

", s, and y are positive integers.

Also, when s is least in value, s and y are least in

To the Spirits say

Substituting from (4) in (3):

Storn (4):

$$y = n^{2} - n (n - 1)$$

(5)

 $x = \frac{n-1}{n} \left[ x (n-1)^{-1} - n \right]$ 

(6)

$$s = \frac{n-1}{n} \left[ s (n-1)^{-1} - m \right]$$
 (6)

Expanding the parenthesis, n divides formally every term except the last two, which, when a is odd, are

The least value for z in this case is z = m. When n is even, the last two terms are -z-m. This expression cannot be zero, and must, therefore,

contain a at least once, numerically.

$$\frac{-z-m}{-}=-1$$
 (8)

which is the least value for 
$$z = n - n$$
  
Substituting from (7) and (9) to (8)

Substituting from (7) and (9) in (5):  

$$y = n^n m - m (n-1) = m (n^n - n + 1)$$
 (10)

when n is odd,  
and 
$$y = n^2 (n-m) - m (n-1)$$
 (11)

(10) and (11) give the least solutions.

In order to include other solutions, we must evidently add a term of the form pn\*1, where p may have any positive integral value, including zero.

Therefore, the general solution is:  $y = pn^{n+1} + m (n^n - n + 1)$ (12)

when n is odd,  
and 
$$y = pn^{n+1} + n^n (n-m) - m (n-1)$$
 (13)  
when n is even.

In (12) let p = 0; n = 5; and m = 1, then  $5^{*} - 5 - 1 = 3,121$ , the least value, which is the answer to the original problem. Let p == 1

18,746, the next value, etc

For 4 men and 3 monkeys In (13) let p = 0; n = 4, m4 × 1 - 3 × 3 - 247, least value 4 <u>247</u> (61 + 3)

abtract 
$$(61+3)$$
2 4  $\sqrt{183}$ 
 $(45+3)$ 
3 4  $\sqrt{135}$ 
 $(33+3)$ 
4 4  $\sqrt{90}$ 
 $(24+3)$ 

subtract

For 10 men and 1 monkey In (13) let p = 0, n = 10; m = 1.  $10^n \times 9 = 9 = 80,999,999,991$ , least value.

#### Conservation of the Atmosphere.

To the Editor of the Scientific American:

A recent article in the Scientific American attracted some attention on the subject of an exhausted atmos phere, or rather, the depletion of the oxygen from the atmosphere. After reading it, the writer asked a col-lege professor if he believed there was a real danger of exhausting the oxygen in the air.

He replied that he guessed that it would last as long hib ad sa

But this reply will not satisfy the scientist, who is weighing things in scales that weigh a hair, nor the philosopher, who reasons long over trifles light as air. This marvelous atmosphere of ours is not a chemical compound, but a mechanical mixture of two gases. oxygen and nitrogen, in the proportions of 20 and 80

or cent, respectively.

The oxygen being the active element, and the nitro gen the diluent or vehicle for the other gas, the normal sphere exists in a balanced state, i e., the amongulare extent in a mainter state, 1 e., the loss of oxygen is continually replaced by the plant life, which has the power, in the presence of sunshine, of decomposing the carbonic acid gas produced by respiration of the animal life into its elements, when the green leaves of the plants absorb the carbon for their own tissues, and restore the oxygen to the atmosphere its original purity.

Carbonic acid is continually added to the air in

the various processes of nature, as respiration, combus-tion, oxidation, fermentation, putrefaction, and so on. Between the processes just mentioned on the one hand, and the absorbent power of plant life on the other, in the normal state a balanced atmosphere is maintained.

In the wisdom of the Creator this action was to be reciprocally maintained until the end of time, but man

reciprocally maintained until the end of time, but man has disturbed this boautiful bainner by introducing new methods and processes ultra-natural Ergo, new problems are introduced, which must be considered. How long will this equation stand sub-traction on the one side without comprenation on the other aids? The constant loss of oxygen must be feet. and we claim that the grave increase of germ disand we calm that the grave increase or gorn one cases, and their fatal recurrence, the lack of vitalising power in the air, the marked climatic changes, the droughts, and fluctuations of temperature, and other variations from nature, are results of a steady con-

sumption of the life-giving properties of the air. course, this change would be noticed first by trained observers, then more apparent, and finally be obvious to all. The feverish activity of this commercial age is rapidly consuming stores of coal, iron, and timber, that might last for ages

The intense industrial age in which we live is prothat must surely react in danger, disease, disaster, and death. But what is the remedy? Suppose there be none! Just suppose that this accel-

eration go on, what will it culminate in? For example, the ocean speed craze; the intense rivalry that has existed between the three great lines of trans-Atlantic steamers, Cunard, German, and White Star

We know to our sorrow how that has culminated, in the loss of the mighty "Titanic," ramming an iceberg at midnight, under a speed of 21 knots with the awful penalty of 1,600 lives But who pays the penalty? The American people Take the motor car speed mania Faster and faster, sixty, seventy, a hundred miles an hour. But who pays the penalty? The American peo-

Aviation is the same; he flew, he fell, he died The same story all around. Acceleration beyond the limit of safety—Sad, is it not? I repeat, the people are unbalanced, and so is the of safety

atmosphere in which they live. Let someone disprove

But to return to our problem of the air we breathe sixteen times a minute. How shall the atmosphere be

The air in which we live exerts a normal preat see level of 1473 pounds to the square inch, which is produced by the super-incumbent atmosphere extending up for possibly a hundred miles. Our life is dependent upon the state of this air. It is capable of certain amount of saturation, expansion, depletion, infection, compression, exhaustion, and restoration.

Let us notice briefly some of the ways in which the

First, positively, by combustion. Vast tracts of forest timber have burned down annually, and every acre burned must not only be added to the positive side of the equation in the products of combustion, but also be subtracted from the side that furnishes the power of restoration. But to the loss of vegetation, by which the carbon dioxide is separated, there is an additional loss of molsture-producing medium to furnish aqueous vapor Where is this loss compensated? Second, negatively, by loss of aqueous vapor This

is essential to health, as the electricity in the body is rapidly dissipated under certain conditions. And disease is induced Saturation beyond a certain point reacts toward depression. Natural balance is main-tained by the sun and wind, and evaporation; the air taking up all the moisture it is receptive of, and con-veying it over wide areas

Third, absolutely, by depletion or exhaustion, and by fection The cities are filled with air-depleting plants, that exhaust the natural restorative properties of the that exhaust the natural restorative properties of the atmosphere Hundreds of power plants, foundries and furnaces exhaust the oxygen and electric properties of the air, while loading it with the suffocating products of combustion. Smelters consume the vital, and add the lethal.

By infection the air takes up bacteria in dust, and distributes them widely along city streets, and in crowded stores and offices, on trains and otherwise The system depicted of vitality cannot resist these unseen invaders, and easily succumbs to discusse. Of course, the total amount of oxygen in existence is not lessened, but is rendered inoperative.

The final question to be met is regarding conserva-tion and restoration of the atmosphere. How to con-serve and how to restore? If natural law could prevail, a balanced atmosphere would be maintained, but it is a serious question indeed.

ely allied to this are the problems of forest con servation and water storage, which we hope to take

We respectfully submit that there are certain inslien able rights declared in the immortal document and secured under the Constitution as being common to all

men. Among these are life, liberty, and the pursuit of happiness. The right to live and to be free and happy. Necessary to tife and enjoyment of it is health, and this cannot long be maintained under the adverse conditions of inquire water and infected air. Much has been done to secure a supply of pure water in our cities, but the air is just as much a common memore as ever. There are times when the only breathing places are the parks, the river front, and the shore; but how many of the poor never see them.

Air is the universal medium of life, and as such should be properly conserved, like any other universal

"All experience has shown that mankind will suffer. while evils are sufferable, rather than to alter or abolish the evils to which they have become accustomed."

Schroon Lake, N. Y

WILLIAM MARSH, TO SECURE OF THE PROPERTY OF T

## The Harbors of the Pacific Coast

#### Terminal Facilities for the Panama Canal Trade

By Wm. Hosea Ballou Sc.D.

THE coast line of the Pacific coast of The United States as defined by the United States coast and Geodefic Survey as 1,852 miles long from hendmad to head-find, and \$300 miles long with indentations Originally its natural harbors may be said to have been confided to San Francisco, San Diego, those on Paget Sound and the Columbia River As populations increased in California, Oregon and Washington, there was a corresponding growth in water-born taility, and Congress, from time to time, made appropriations for the improvement of rivers and harbors Oregon has received the greatest sum, \$21,200,000. California's appropriations have totaled \$19,300,000, and Washington has been granted \$10,155,000.

To the above should be added the immense outlay for railway terminal whereas municipal what systems and the expenditures by corporations and individuals, bringing the approximate total up to probably over \$100,000,000

#### State of Oregon.

PORTLAND HARROR -Portland is located on the Willamette River, 12 miles above its entrance into the Columbia River, which is 110 miles from the mouth of the lat-ter, and at present is the head of deep water navigation Light-draft boats may ascend the Willamette 150 miles. By us ing the State portage road between Celilo and Big Eddy, they may ascend the Columbia and Snake rivers during higher stages for an additional 537 miles, this last stretch being the greatest of American logging and rafting waterways Logs from 20 to 90 miles inland are floated over tribu taries to saw and shingle mills upon its banks. Rafts of logs and piling timbers, of 6,000,000 feet each, are towed over it during the season, and thence by ocean to California ports. The annual commerce amounts to eight million tons, valued at \$75,000,000, of which a little over one half is sea-going

Congress is asked to appropriate \$1,-344,000 additional for use this year in continuing the jetty work at the mouth of the Columbia River, bringing up the total expenditure to date of \$11,488,000. More than as many unfillions will be required before this important entrance is under permanent control, and it is doubtful if its annual maintenance for dredging, etc. will ever be less than at present, about \$105,000. Of the projected seven-mile jetty (the longest, by far, ever conceived), only about 19,000 feet were completed on the first of June, leaving some 18,000 to be constructed on the ocean end, in at least 40 feet of water. When it is finished, there will be still the north jetty to build-two thirds as long, and as costly. At the present rate of construction, it will require twelve years to complete the present south letty and sixteen years to build the north jetty. Thus, a total of twenty-eight years must clapse before Portland can hope for a cause before Folland can hope for a 9-foot channel such as admits shipping to New York harbor. Of its vast utility and necessity, however, there can be no doubt. The mouth of the Columbia River, which it is to control when completed, is 8,000 feet wide. The navigable channel within it swings like the nervous coils of a snake, moving its position 2,500 feet aunually, first one way and then back again cessity of jettles on both sides, to compel the channel to remain in one place is thus shown, so that by the use of dredges, it may be kept at the required

Coos Bay —Coos Bay is the second Oregon harbor in size, and it presents no especial natural difficulties to overcome Vessels drawing 22 feet of water may now cross the bar at high tide, enabling the



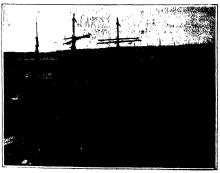
Lake Washington canal, Seattle, showing the cofferdam and lock-pit.



Vessels of the Pacific grain fleet in Portland, Oregon, harbor,



Filling in the shallows at Los Angeles harbor.



Typical shipping scene at Long Wharf, Oakland, Cal.

port of Marshfield to handle, last year, 300,000 tons of freight and 25,000 passessers, between it. San Francisco and Portland. The harbor is 120 miles south of the mouth of the Columbia River, and it is the principal ocean port of Oregon, being located in the enter of or adjacent to the statest forest region and the most fertile valles.

The Coos jetty has a history far more inviting than that of any other on the Pa-cific Coast. When its construction was clific Coast. When its construction was commenced in 1879, there were only 10 feet of water on the bar. The first project called for 1,760 feet of jetty, which was speedly built, at a cost of only \$213,750. As the channel still continued movable tortuous and unstable, Congress in 1890 ordered the north letty continued to a length of 9.600 feet and the constru of a south jetty 4,200 feet long. The exor a south jetty 4,200 reet long. The ex-tension of the north jetty was completed in twelve years, at a cost of only \$721,720, of which \$190,721 was for maintenance. The channel deepened naturally and became stable, so that it was not necessary to construct the south jetty. Deducting maintenance, it will be seen that the actual cost of this jetty was only \$77 per foot. After a lapse of ten years, the condition of the jetty is practically normal. Its enrockment has only slightly subsided. Its tramway and receiving wharf only have been destroyed, the result of the work of the teredo and consequent de-Cav.

#### State of Washington,

TACOMA HARROR-TROOMS has one of TACOMA HARDOR.—Tacoma has one of the deepest harbors extant, ranging from 200 to 600 feet in depth. At the south end of the harbor are extonsive tidal flats, bare at low water The city water front is along the southwestern shore and the harbor lines have been established around the south end of the bay and along its western side. Several waterways extending into the flats have been projected, of which the most important, the City Waterway, has been completed at a cost or \$162,480. Its depth varies from 25 feet to 15 feet at its south end. Tacoma's at harbor problem remains unsol and has languished for three years. This project called for the deepening to 28 feet of the Puyallup waterway for a width of one half of the work was completed, at a cost of \$159,585, freshets brought down such large deposits in November, 1999, that the 1,811,590 cubic yards dredged were replaced by more than 1,000,000 cubic y more than 1,000,000 cubic yards of debris. All work was then stopped and the channel has since refilled. A board of government and filled. A board of government engineers decided, after a survey, that the only solution of the problem was to divert the bed of the Puyallup River and have it empty elsewhere than into the waterway of that name. As such diversion is not comprehended in the scope of Govern-ment operations, it will never be done unless private, city or Sinte interests do it. Meantime, Tacoma is going ahead with its wharf terminals on an extensive scale, lesving the Puvallup for later considera-

Garra Haron.—Grays Harbor to the name of a top-shaped bay fourteen by servanteen indicates in area, forming the mouth of the Chebalis lilver. On it are located the thirting sawmil cities of Aberdeen, Hoquism, Cosmopolis and others, which contribute shout 180,000 tons annually, moutly of lumber products, to commerce. Here the usual jetty problem was encountered at the outset, a convex bar having primerally formed two miles out at sea, across a channel shout 100 feet deep, diminishing landwards to 30 feet. The two

estrainess through the bar had 12 to 12 feet of water, participally shifting. In 1896 Congress sutherised a south jetty three and a balf miles long to control the field entreats existing between two sandy peninsulas, 12,500 feet distant from each other. In 1902, when the 15,600,000 state distant from each other. In 1902, when the 15,600,000 state distant rome each other, in 1902, when there work on it was abandoned. In 1907 Congress authorized a north jetty of 9,000 feet length, and, in 1903, it as extension to 18,000 feet, to bring up its outer end opposite of the end of the south jetty. Local interests contributed the land for the treatle approach and operating plant. The jetty treatle is at present 12,754 feet long and the enrockent finished up to 12,756 feet, feet wide at the creek; to the mid-tide level. Nature offers no such transmous opposition and difficulties here as at the mouth of the Columbia River; but, for that matter, it is doubtful if the latter has any rivial extant for battering and destructive

SEATIL'S engineering problems do not call for much comment. The harbor works concern two fresh-water lakes, Union, within the city, and Washington, on its borders. A navigable connection with Puper Sound is proposed for the former, and the improvement of the Black and Duvamish rivers forming the connection of the latter. A channel has been dredged, by feet wide and 10 feet deep, between the Nound and the wharves at Beitard, in Naimon Bay, a distance of 2,000 feet, with a turning healin 170 to 500 feet wide A cut has been excevared between Lake Union and Salmon Bay to control the water level of the former From Ballard to the lock site the channel is 25 feet wide and 10 feet deep. In June, 1100, Congress nuterised the control the control the former controlled the control the located the located the former controlled the could be former to the located the control that the control the control the control the control the control that the control t

commerce. A belt line railway is being built along the entire water front to facilitate the movement of freight

Los Angries -- Los Angoles berber was crosted by the annexation of Sau Pedro's outer and Wilmington's inner harbors. Originally San Pedro Ray was an open roadstead, protected on the west by a bluff known as Point Fermin, but exposed from other directions. In 1897 Congress made available \$2,900,000 to build breakwater from Point Fermin 8,500 feet out into the Pacific Ocean. The fund was sufficient to extend the breakwater 9,250 feet from Deadman's Island, to terminate in 40 feet of water This portion of the work consists of two straight arms, connected by s curve 1,800 feet long, having a radius of 1,910 feet The westerly arm is 3,000 feet long, the easterly arm 4,450 feet long. Deadman's Island has been connected with the mainland by continuing the breakwater to 11,275 feet in length. The breakwater is 122 to 194 et wide at the base, 38 feet wide at low water and 20 feet wide on top, 14 feet above low water. feet wide on top, 14 reet above low water. This oreas-water can only be described as one of the greatest extant, creating, as it does, a magnificent readstead out in the ocean. To construct it 2,563,777 long tons rock were used, with rocks weighing three tons each and unward.

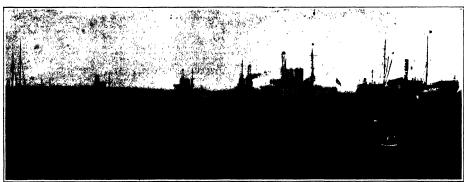
On invitation, Mr. Irving T. Bush, projector of the Bush Terminals of Brooklyn, has inspected Low An geles' harbors with a view of suggesting how they can be made to anticipate the further increase of trade to result from the opening of the Panama Canal — He recommends the construction of a wharf three-quarters of a mile long. Such a where would be 2006 feet longer than any now wetton! The city has now twentytwo miles of improved water front! ciseo. The harbor is essentially the San Antonio estuary, an arm of San Francisco Bay. The project of 1874 resulted in the construction of two high-tide training walls at the entrance, a that cannot one and a half miles long and 400 feet wide, commerting with San Leandro Bay, a that basin with a champel to San Francisco Bay and three steel bridges across the tidal cannal Next, a number of channels were excavated into Oakland and the jetty was extended 250 feet. Since then cannis and waterways have been deepened, the main channel to 30 feet and the widen lag processes have been continued up to 560 feet. Today the tidal cannal has been extended to four and three quarter miles in length, the channel around the tidal leads to two and three eighth miles and the channel in the tidal cannal to two and one quarter miles Congress has authorized further improvements to the extent of an additional \$765.482, and has appropriated \$150,000 of it to be separt this year.

#### City Planning Congress at Duesseldorf, Germany, 1912.

DUESSELDORF, the most beautitud and indeed city in western Germany, known as the 'Park City' and the center of the industrial coupie with its extraordinary commercial and political developments, probably without a rival throughout Europe, is at present holding an exhibition on city planning, city operation and city administration functions.

The exhibition will had from June 20th to October 31st, while the International Congress will be from the 23d to the 28th of September The first group of exhibitions consists of general

The first group of exhibitions consists of general ground plans, traffic systems, such as rallways, local



The Pacific aquadron assembled in San Diego harbor.

at the entrance to Salmon Bay, and an unbroken channel-way therefrom, through Salmon Bay and Lake Union to Lake Washington The channel, or canal. Is to lower Lake Washington to the level of Lake Union. The cost entimate was 33,55,50,00, of which Congress appropriated 22,500,000, for the looks and accessories only, settle agreeing to pay for the channel work and to secure the government from all damages for lowering Lake Washington or rating the level of Salmon Bay.

Say Disso.—Stan Disgo's bar was originally out by a natural channel 200 feet wide and 21 feet deep at mean low water. In 1876 Congress appropriated \$80,000, with which a dike was thrown across the menth of the San Disgo Birty for the purpose of preventing itse deposits from injuring the harbor. In 1890 Congress authorised the construction of a 1,500-foot jety on Zinnings Shoal, at the harbor entrance, and the maintenance of a channel 24 feet deep. When this project was completed, the channel first deeponed from 26 to 25 feet, then subsided to 24 feet. Continued dredging increased the maximum depth to 27 feet. The average tide here is 4.5 feet, as against 18 feet in the Pacific Northwest. In 1910, Congress attenties of a channel 30 feet deep at the outer har and \$500 feet wide, so as to admit the Pacific squadron and smalle the warning to coal at La Plays. This work will be completed by the time of the opening of the Panama Canal and the Panama-California Expention at \$600 feet wide, so as to admit the Pacific Squadron and the standard-California Expention at \$600 feet wide, so as to admit the Pacific Squadron and the standard-California Expention at \$600 feet wide, so as to admit the Pacific Squadron and the Sq

San Francisco -- San Francisco has the great vantage that it is a practically natural harbor Government has never had to concern itself in its b half, except to remove rocks, which mostly projected where they could always be avoided. This natural harbor is forty miles long and from three to ten miles wide, with thirty-six square miles of anchorage area, ranging from 40 to 90 feet in depth. Its main entrance, Bonita Channel, has a permanent, unshifting depth of 48 feet, which 90 feet in depth. e has and probably pover will require a dredge It has other channel entrances also, none of which have less than 30 feet of depth. The only impedints to navigation were the rocks mentioned, marked with buoys or lighthouses. Of these, Blossom, Arch and Shag rocks Nos. 1 and 2 have been removed to a depth of 30 feet, and also Noonday rock, thirty-three mlies west of the entrance Work was stopped on Rincon rock at a depth of 24 feet, when the city took the base over for a wharf and included it in the pier-head line. In 1910 Congress authorized a depth of 40 at of water to replace Centissima rock, in Bonita annel, and 35 feet of water in the place of two Channel, at rocks near Mail Dock. In this work \$515,928 have en spent and \$250,000 more have been authorized It is evident that San Francisco harbor must remain the only one on the Pacific Coast, for many years, that can admit the largest of the world's ve

OARLAMS—Oakland commenced harbor building in the first and work has been done intermittently were since. It is now a greater harbor than it has commerce for, and spaculation is fire as to what benefits will accrue from its future enlargement. As it is, 66 per cent of its tonnage goes on ferry transfers across the bay, consisting of overland freight consigned to San Franand express facilities, elevated, subway, suspension and street railways, aviation stations, city embellishment, bridges, docks, parks, lawns, forests and real estate politics.

Under city operation are grouped: Gas works, water works, electric central stations, sewage systems, street

cleaning, refuse disposal, cemeteries and crematories. Under the third group, administrative functions, are exhibited plans and models of hospitals, roscue homes, poor houses, lodging houses, orphan asylums, homes for widows and the aged and infirm, schoots, churches,

museums, art galleries, libraries, concert halls, etc.
It will be noticed from the foregoing items that this
exhibition is planned with the well-known German
thoroughness so that hardly any subject is outlitted that
is of importance in city planning, city operation and

The addresses and papers will be read in the principal languages, German, English, French, etc.

#### Lieut. Scott Wins the Bomb Prize.

THE trials for the \$5,000 Michelin prize for bomb-dropping from an acceptance at a height of 2,000 test ended at Chilonson Anguest Ultim an American Meters, subtlect to confirmation by the Prouch Acro Club. The winner was Letter Scott of the United States Arm. Scott dropped the bombs fires at a time. The first three fell outside the trarget, which was a rectangular space 170 by 40 feet. Subsequently Scott succeeded in dropping club plospeties within the target. Readers of the Sciencia Ambata as will dauthless recall a very interesting article that Lieut Scott wrote for us about a year upon his method of dropping bomb.

William Barrell

#### New York's Double Deck Car

LAST spring there was introduced in the streets of New York a peculiar low street car, which gained for itself the name of the "hobble-skirt" car or the for itself the name of the "nonnessure or or or the "stepless" cur for the reason that it was hung very low, and hence required no step between the street level and the floor of the car. This result was ob-tained by placing the driving motors at the end of the car and the car body between them. The entrance to the car was at the center.

When it was found that the low stepless car was a success, it was only logical for the next improvement to consist of an upper story placed over the low car. By an ingenious disposition of the various parts a double deck car has been evolved which is only seventeen inches higher than the ordinary car that runs up and down Broadway A At each end of the car are th

the upper deck. Here there are two long seats running the entire length of the car, and arranged back to back Thus the aisies of the upper deck are at the outside. whereas the aisle of the lower deck is in the center, where there is plenty of head room directly under the ents of the upper deck The seating capacity of the new car is 88 pas sengers, and there is standing room for about



Stairway to upper deck.

standing room for mone 80 more The senting capacity of the long open cars now in use is 60, and of the short ones, 50. While the long closed car will sent int 33 and the short ones but 28. The pay-assyu-enter-cut has room for 41 to 47 seated, and the single deck stepless car has seats for 51 While the double deck car is a decided innovation in

this country, it has long been in use in Europe. However, the design is decidedly different; in our car the stairways are placed at the side and are entirely en closed, so that the passengers need experience no timid-ity about climbing from one deck to the other. In nointing from the lower to the upper deck the pas-sengers have to rise less than two feet more than they would in loarding an ordinary car. The upper deck of the car is roofed in, but the sides are open, except for a protective netting. In the winter time this will be replaced with solid panels and windows. The car is now being tested to determine whether it can be unhow dead and loaded rapidly enough, particularly from the upper deck. As the only exit and entrance to the car is at the center

may be some difficulty from congestion at this point. If it is found that the car may be readily unloaded and loaded there is no doubt that many cars will be ordered for use on the crowded streets of New York Thus, in economizing in the number of cars operated, there will be a material economy in opcrating expenses, and added to this there will be less congestion of the streets, and consequently a more rentd

#### East African Cedar for Lead Pencils

THERE are about twenty lead pencil factories in and around Nuremberg, Germany,

which consume approxi-mately 100,000 tons of cedm wood annually. All of the lead pencil factories in Germany excepting one small concern at Regensburg are located at Nuremberg. For 250 years the operators of these factories have been dependent on America for their supply of pencil cedar, nich includes the northern red cedar (Juniperus virginiana) and the southern red cedar (Juniperus bar-badensis). Suitable woods from other sources have been sought for a number of years, but none have ever been found that were so satisfactory, or that approached in quantity and quality the cedars of the eastern and southeastern United States It has re-cently been announced, however, that this dependence on the American product is almost at an end, since the

Water-akates folded up for easy transport.

extensive Schume forests of cedar (Junipe extensive Schume forests of cedar (Juniperus process) in German East Africa are being exploited. These forests are said to furnish a wood equal in quality to the average grades of the American cedars and sufficient in quantity to satisfy the needs of the German factories for a good many years to come. The German government had an investigation made

of these forests with a view to developing them and to render the timber supply available for use. It did not lose an opportunity to make known this large sup-ply of cedar wood, and a concession has recently been granted to a company for the exploitation of this valu-able timber. The company has constructed a cabletram line at a cost of nearly \$400,000, for the purpose of bringing the logs to the mills. It is the steepest cable-tram line in the world, and is said to be a masterpiece of engineering skill. The line is now being suc-



New York's new double-deck car. Only 17 inches higher than the codingry cor-

cessfully operated, and the cedar logs are converted into lumber and transported by rail to the port of Tanga, in Usambara. From here it is shipped by the steamers of the East African Line to Hamburg—the principal distributing point.

Many government officers have tested the lead pencils Many government onevers more center to read person-made from this African cedar and have approved them; the Prussian ministries of finance and of the interior both have recommended that pencils made from East African cedar should be given pro Practically all the leading German lead pencil factories are now using some African wood, and the pencils made from it are pronounced to be equal to those made from the American cedar.

#### Water-skating

TTEMPTS have often been made to design some A TEMPTS have often men to walk on the surface of water, and especially during the last few years a num-

at air wa body the results of many years' studies and lader gable experimenting, look very much like skin, h low weight and m strikingly low weight and small dispositions, call cordingly allow the shear to gilds 'on the water-an extreme case. While in ordinary rewing one to turn his back to the direction of motion, water-ing has the additional advantage of allowing the to be turned forward, so that the eye on ac the erect position can sweep freely over a wide ex-pense of water. A further advantage of the new water-skates, which on account of their low weight are readily transportable, is the possibility of feeding them into a small and extremely handly bundle, after all ing the compressed air to escape from the floats (con-sisting of pointed escutchous cylinders and rubbereith covers). They are pumped up again and mounted for use with the same rapidity

and ease.

At the underside of the water-skates are attached movable fins which by opening at every move, enable the skater to slide on with the utmost facility. Another possibility which affords additional va-riety is to use alterly with the work of the legs, a light paddle en-dowing the skater with a mobility attained by no water craft. Every

where, even on the most frequented waters, will the skater be able swiftly to make his way through the crowd of ships and boats.

Water-sking in this new form seems to be any-thing but a dangerous sport. The feeling of absolute safety which is experienced by the users of water-skates is based in their very construction: The keel running underneath the water-skate (and tied up to the insures a very sufficient stability, excluding any risk of tumbling. In fact, no fall or other accident has so far occurred on any one of the numerous trips made on water-skates nor in connection with the exercises of og water-skates nor in counterton water. However, provision has been made even for the remote possibility of an accident. In order not to be hindered in swimming the skater is, in fact, able with a single move to free his feet from the water-skates. The only back motion of the locking lever required in this connection is effected without difficulty and with an absolute safety in any position whatever. A safety device preve involuntary detachment



Gliding on the water may be assisted by a light puddle.

her of "water-skates" have been invented for the pur-nose. However, all these designs showed the drawback of possessing a weight much too high, their dimension re too great and transport too inconvenient and difficuit over land to allow any pleasurable sport. In fact, the prospects of this fascinating water pastime were anything but promising.

However, on the Lake of Gross-Wusterwits, in the Prussian Province of Saxony, water waters moving with surprising sgillty have now made their appear-ance in great numbers. They use a novel type of nonrigid water skate constructed by the Deutsch haufschuh-Werke, which may be said to eliminate all the drawbacks so far inherent in this mode of locumo-

#### German and French Airship Rivalry

T HE fact that one of the Berlin papers stated that Germany ow had as many as 27 balloon sheds for airships, led the Paris daily Le Matin to resume the question of relative strength of these rival countries Germany is laying grea stress on the airship question and appears prefer the airship as being best suited to the national character. The 27 airship hangars ap pear to lie mostly or the frontiers of the country, headed by the great Friedrichshafen Zeppelins, then Hamburg, Frank fort, Mets, and others. New

hangers are planned at Withelmshafen for large marker alreships saging 25,000 cubic yards. It is difficult to say just how many military airships Germany possesses, for these are often transformed and their issues changed, but there are probably not more than ten or a dosen fit for use. France has nearly the same number at present, and there will soon be three new airships finished. As to the hangars, there are 8 on the cent frontier and many others in the Paris raylog, as elsewhere which make about 20 in all. The posttion of the two constraints as about outsil as to the number of the two constraints as about outsil as to the number of hangare are planned at Wilhel mehafen for large marin snewmer water mass arout 20 in all. The position of the two countries is about equal as to the number of alreitips and hangars. Germany is spending large sums in this direction, and this is not the case in France, for the most of the strengthon is given to earnglaines.

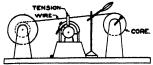
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#### tiple Wire-winding Apparatus By Norman Bards

THEN the austour experimenter starts to build by tags cells, the winding of the wire generally looks thin a great task to him; and so it is when the wire to be wound is small and hundreds of feet are to be It so happened that the writer was into led. It so happened that the writer was interested the making of a large coope generator which had to simbled in a very short time. The secondary was consist of 10,000 feet of No. 40 enameted wire. How wind the wire in a short time without breaking it or ving any laps in the winding was the problem.

The driving mechanism of an old model Edison shonograph was brought into use, and made to guide the wire and at the same time to keep it taut.
was done in the following manner: A tension A tension was d to the bridge that carries the needle.



winder made out of a pl

chine was placed so that the tension was ab inches from the core, which had been put between centers as shown in the accompanying figure. The speed of the machine was then slowed down so that the core could be turned about seven times while the tension moved to the right a distance of one fiftieth of an inch, i. e., while the record cylinder made one revolution. In this way the wire was wound on the core, which was three inches in diameter, in one after-A magnifying glass was used as shown in the

figure to assist in watching for any kinks in the wire.

It was surprising to find how well the work could be accomplished when one person turned the core and another regulated the speed of the machine and watched for any trouble in the winding. With this arrangement, as soon as anything went wrong, the one turning the core would immediately stop, and the other person would drop a little paraffin on the wire on the core to prevent it from becoming loose. A part of the wire could the nd and the trouble fixed with no fear that the rest of the winding would be loosened. It was also found necessary to have the distance between the core and wire reel as short as possible. The shorter this ance the less danger there is of the wire's b ing. This last applies especially to the winding of the finer wires. Two other factors are to be taken into consideration. These are that the reel must turn very noothly and easily, and that the winding must be done evenly and not by jerks.

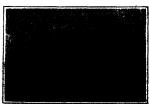
#### A Simple Microphone and Reproducer By C. C. Kiplinger

HEREWITH illustrated is a simple microphone and also a rather unusual application of this interesting instrument. It comprises two short lengths of %-inch electric light carbon. These are inserted in

each end of a bit of %-inch rubber tubing.

The ends of the carbon rods within the tube should is about 1/2 inch apart. This space is loosely filled with granular carbon free from dust, obtained by crushing arc-light carbons in a mortar. The granules should not be more than one thirty-second inch in diameter The pressure on the particles may be varied by shifting one of the rods.

Copper wires are twisted tightly about each rod to



serve us connectors. If the carbons are copper-plated the when should be soldered to the plating. The hatrament is connected in series with a telephone reserver and a buttery of a half dozen cells. When the indercophone is properly adjusted, a very small distinguishment of the carbons will cause a corresponding distinguishment distinguishment of the carbons will cause a corresponding distinguishment of the carbons will cause a corresponding the carbons will cause a corresponding the carbons and the carbon of the carbons and the carbons are carbons as a carbon of the carbon

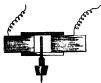
Charles of the Salar Salar

sponding movement of the carbon granules, and the reed to the current will change. This caus a sound in the receiver. A cigar box provides a good anding board for the apparatus.

With a slight modification, this device becomes a firstclass reproducer for a gramaphone. The sound waves engraved on the record may produce electrical vibra-tions, which in turn, are reconverted by the telephone receiver into sound waves in sir. A lond-snesking will make these audible to a large aud

A small silt is cut in the center of one side of the rubber connector. A short piece of three sixteenths inch brass tubing is flattened for a part of its length by hammering, and the flattened end passed thro the slit so that it just clears the opposite side of the cavity. The flat surfaces of the tube should be parallel to the ends of the carbons. A small cork and needle are attached to the other end of the tube, as shown

The photograph shows the apparatus in working rder. It is supported by a stand, a heavy wire, and a counterbalance of some sort. The connecting wires mid be very flexible, so as to offer little re to the motion of the microphone The sound waves ed on the record are transmitted to the carb granules by the needle and brass tube. The receiver



Details of the reproducer

may be at a distance from the reproducing microphone Very interesting results are obtained by changing very interesting results are continued by canaging the angle of the needle with reference to the disk, so that the record may be run in the opposite direction. The vibrations are reversed in order, as are the vocal infections, producing in many instances extremely ludicrops effects

#### Etching Glass With Hydrofluoric Acid By Norman Barden

T is sometimes desired to etch a small design in a I T is sometimes desired to each a busin design.

place of glass or a label on a bottle. To do this on small places of glass, not larger than twelve inches square, does not require a great deal of expensive ma-terial if done in the following manner: The glass piece to be etched is first covered with a thin layer of paraffin wax or beeswax. The design to be etched in drawn on a piece of glazed paper with a soft pencil. The drawing is now placed against the wax coating and is rubbed all over the back with some blunt instrument. On removing the drawing, the design will be clearly seen on the wax surface. The design is now cut in the wax, i. e., wherever the glass is to be etched, it is cut free from wax. Now, as to the etching, this can be done in two ways. The first method to be described is very convenient for etching small designs and graduation marks, as on thermometers and A tuft of cotton is fastened to the end of a piece of copper wire. With this, hydrothoric acid is awabbed over the design until it is etched the proper depth. The operation must be carried out in ell-ventilated place or in a slight draft. of the acid should never be breathed, and the acid of the acrd among never be breathed, and the acrd theself produces severe burns if it touches the skin Commercial hydrofluoric acid is obtained in paraffin-lined bottles, and must be kept in these containers or in gutta-percha flasks. For the larger pieces of glass to be etched, it will be found best to do them gass to be exceed, it will be found near to do them in the following manner: Finely crushed calcium fluoride or fluorspar is sprinkled over the bottom of a shallow lead tray. A lead tray can be easily made from sheet lead by bending the edges up to form the rrom sneet seed by bending the edges up to form the tray sides. Over the finorspar is poured concentrated sulphuric acid. The spar does not have to be entirely covered by the acid. After the deedgn has been pre-pared the glass plate is laid, face down, on the lead tray. It is best to have both sides of the plate covered with the wax when the etching is done, in the following manner: To etch the glass, apply gentle following manner: To etch the glass, apply gentle heat to the pan. This may be done with a spirit lamp or the Bussen fame. This operation should be carried out in the upon or under a hood in connection with a chimner or an exhaust fan. The etching in this last case is done by the hydrofluoric acid vapors that arise from the heated fluorspar and sulphuric acid. The one great caution in etching glass is not to inhale any of the acid fames and never let the least bit of the come in contact with the skin

#### A Home-made Hygrometer By C. S. Meeker

THE accompanying engraving illustrates a home-made hygrometer constructed by the writer more than thirty years ago. The instrument worked well for twenty-five years when it was accidentally broken The instrument consists of a baseboard upon which is mounted a pointer cut from sheet metal. The pointer is ten inches long and is provided with a lateral arm



with wooden expan Hygrometer

at the pivot end one inch in length. The end of the pointer passes over a scale at the bottom of the base-board, graduated in tenths of inches. The short arm of the pointer is fastened to a piece of clear soft pine, 1/2 inch square, cut with the grain running crosswise The lower end of this pine stick is fastened to a stud which passes through a slot in the baseboard and is adjustable therein to bring the pointer to the zero mark on the scale. The pine stick was dried in a kiln and after being taken out was allowed to cool, when it was set at such an adjustment as to bring the pointer zero on the scale. An expansion of one 0.01 inch in the wood would cause the pointer to move 0.1 inch. The instrument was placed in a shed where neither rain nor sun could reach it. On several occasions the solnter stood at zero and at one time it reached as high as two and two-tenth inches, showing, therefore, an actual variation in the length of the stick of over a fifth of an inch between the dry and damp weather The device was not made as a hygrometer, but was constructed primarily with a view to ascertaining the expansion and contraction of timber.

#### Improved System of Filtering By Clarke E. Davis

THE large inverted bottle shown in the cut is fitted with a two-holed rubber stopper, through one hole of which passes a short glass tube extending upward just through the cork and downward to the funnel In the other hole is inserted a glass tube, which reaches to the bottom of the bottle and terminates at the other end in a piece of rubber tubing fitted with

This clamp serves to regulate the inflow of air,



Filter with regulated air flow.

which controls the outflow of the bould. The funnel is supplied with an ordinary plaited filter

This system of filtering is advantageous because it may be started and it will take care of itself to completion, thus enabling one to filter the various precipitated reagents, etc., while conducting a session or en-

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

THE difficulty of starting a powerful automobile engine on a cold day by means of an ordinary hand crank has been brought home with considerable force to those owners or drivers of high-powered ears who operated their cars before the arrival of the various systems of self-starters which now are on the market. And even now, despite the presence of several systems of starting devices, the difficulty is by no means fully solved, for even the most perfect ignition, piston pressure or electric device made, will balk occasionally. Any invention, therefore, which promises to do away with at least

when promises to do laway with a research some of the troublessome difficulties en-countered, deserves careful investigation. Differing radically from every other motor starting device so far brought on the market, the Air Starter contains features which never before have been brought to a practical test, but which appear so logically correct that one cannot refuse them due consideration. The device, which is manufactured by a Detroit company, recently was exhibited in New York city streets, attached to a sixty horsepower, four-evhinder touring car. In several hundred demonstrations the apparatus worked without a hitch



The position of the air starter rted on the springs in front.

The device consists of a small two cylinder opposed air compressor, e.g., then the average man can do it. At the methy should be a small two cylinder opposed air compressor, e.g., then the average man can do it. At the methy should be a small control of the cylinder opposed air southern the compressor are made of the control of the cylinder themselves, and the size of the cylinder of the cylinder opposed are not controlled to the cylinder opposed are cylinders themselves, and former the cylinders themselves, and former the cylinders themselves, and former the matter opposed are cylinders themselves. and forcing the pistons down by this means, the air crank simply replaces the human arm on the crank handle and turns the crank by means of a mechanical arm. How this is accomplished is clearly visible in the accompanying diagram

The air crank consists of a semi-circular cylinder in which a piston is free to move in an arc of about 160 degrees. The piston in an arc of about 100 degrees. The person is firmly attached to the crankshaft by means of a cranking arm fitted with a rachet device. When compressed air from the tank is admitted into the cylinderwhich is accomplished by simply pressing a button on the foot board -the piston is pushed around with great speed and power until the cranking arm hits the bumper which movement is equal to turning the engine over two or three compressions soon as the bumper is touched the rachet device is disengaged and the long helical spring returns the cranking arm and pustor spring returns to evaluating arm and paston to their original positions. In case of a beek fire before the arm has reached the end of its turn, the ratchet is also disengaged

Self-starter Device for Automobile by contact with a tripping pin acting as in automatic release, and the orank arm returns to its normal position.

By Theodore M R von Kéler By Theodore M R von Kéler The addition to cranking the motor the The guide is made of high carbon characteristics.

By Theodore M R von Kéler The guide is made of high carbon characteristics and the returns to the motor the transfer of high carbon characteristics and the returns to the motor than the motor than the second of high carbon characteristics and the results of the results

compressed air tank is arranged so as to nel steel securely braced and bolted to Plug Cock With Removable Sleeve A PLUG cock or faucet is much more desirable than a compression cock or screw faucet because it is cheaper to pro-



ram of installation of air starter device, showing conn between air crank at the right and air tank push butt

accomplish other work around the car. gether The principal factors are two A hose valve on the dash, and a length of flexible hose with a tire gage for filling the tires, dusting the car, etc., are provided. An air signal can be connected powerful emergency air brakes attached, constant pressure supplied for the gasoline

tank, etc. By simply pressing a foot button when the car is running, the driver osn connect the compr at will It is claimed that operating the compressor for about five minutes two or three times a week is sufficient to maintain a pressure of 250 pounds in the storage tank. An air gage on the dash indicates the pressure.

#### A Tractor Steering Device

THE growing use of trace tors and the searcity of reliable trained help has led to the invention of a substantial device that automatically guides a trac tor in plowing or in break-

13 and 14 feet long, respectively, bolted to each other by brace rods of the same size material, so as to form a triangular frame

At the front end of this triangular frame is a single wheel and a long steel shoe The wheel runs in the previously turned furrow—hugging the "landside"—and by the leverage it exerts on the axle, keeps the front wheels in line. The distance-from the tractor to the furrow is easily regulated by a simple adjustment of two arn angular frame

The shoe at the front end of the fr

affords protection against any accident to the guide should the wheel drop in a hole or strike an obstruction. It also keeps the device free from weeds and other trash. If the guide should strike a hummock, there is no chance of it doubling up, because the shoe will assume the hurden and hold it until the whoel once more has smooth foot-ing. The front wheels are held firm, that

is, kept from sec-sawing.

This device does not interfere with the backing of the engine, and in turning, it de-scribes a circle only four feet greater in radius than the front wheels. In attaching the guide to the engine, the steering chain



duce and is quick acting; for a quarter turn or less of the lever of the plug cock

will wholly shut off the flow, or open it to full flow, whereas with a compression cock, several turns are necessary. However, the objection to a plug cock is that

they are not durable and are apt to leak Furthermore, the repair of a plug cock is rather expensive. Trouble usually mani-

is rather expensive. Trouble usually manifests itself in wear of the edges of the ports and the only way of repairing the damage is to replace the worn off plug with a new one. In order to reduce this

item of expense and provide a ready means of repairing a worn off plug cock an in-ventor has recently designed a cock hav-

ing a removable sleave on the plug. When the ports through this sleeve become badly worn it is a simple matter to remove

the plug from the cock and replace the worn sleeve with a new one. The details

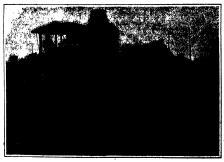
of the invention are shown in the ac-companying cut. A key on the body of

nut bearing against a split-ring washer

#### An Improved Ship Construction

ON June 11th, 1912, there was issued a ON June 11th, 1912, there was issued a Datent, No. 1,028,546, to Joseph William Isherwood of Middlesbrough, England, which, it is claimed, will revolutionize the building of vessels. The invention relates largely to the framework of the vessel and seeks to so distribute the metal of the framework of a ship as to cause the skin and deet plating of the ship to form an assential part of the bracing structure, making this said plating do work or resist strains which ordinarily would be resisted by the framework only.

making this said plating do work or resist strains which ordinarily would be resisted by the framework only. From this, it is assorted that considering ships of equal strength and seaworthiness, of say three hundred feet long, it is found they can be built with about five hundred tone less metal than under the ordinary construction, effecting a saving in cost of say thirty thousand dollars. The parmethod of construction consis making the transverse frames and beams a plurality of times stronger and spacing them a plurality of times farther apart than has beretofore been customary in the same type of vessel, and also in making said frames and beams of a less total weight in metal than has heretofore been customary. ity rests seems to consist in the hat the complex twisting, racking and reaking strains to which a ship is sub-



The steering wheel of the tractor is in front of the frame and runs in a previously turned furrow.

will be efficiently resisted by this p

order disposition and saving of metal.
Although it has only been, say, about tree years or a little over since the first shree years or a little over since the first viscal west to see under this system, yet to-day it is claimed there have been built or are now building over two hundred large vessels using the method, aggregating in cost upward of sixty millions of dollars. Also that a very large number of vessels has been built or are now being built in the United States under this system and that only recently the navy has had commeted two colliers constructed according pleted two colliers constructed according

#### The Trade-mark as a Business Asset By W. E. Woodward

THE average business man has only the value of a tradeark. He does not realize that it is very often the connecting link between the pro-ducer and the ultimate consumer; that it is mbol of good will, a tangible asset with a determinable money value; that it must be chasen and applied not in a haphasard way but with a due regard for its psychological effect upon the public. Nor does he realise the importance of complying with the statutory requirements which secure to se statutory requirements which secure to som a property right in a trade-mark com-arable with the property right that an eventor acquires by taking out a patent. The following is the seventh of a series of

uticles, written by a man who is at once mark, an advertising, and a business expert, a man who has a first han knowledge of the value of trade-marks an of the correct methods of trade-mark exploit norks and The series, which will be eventually published in book form, will include written in business English. the Federal trade-mark law, analyses of the requirements for registration, the elements of irk, and trade-mark pro tection .-- EDITOR.

#### ts of a Good Trade Mark

Continued from page 143, August 17th, 1918) The reader who has perused the prearticles devoted to a discussion what a trade-mark cannot be, begins to wonder, perhaps, what part of the lan-guage is left unrestricted. It is true that the number of restrictions imposed by the law and the courts is considerable, but the language is virtually inexhaustible, with its infinite possible combination of letters and words. And to these possibili-ties of construction must be added the limitiess varieties of designs and symbols hich are registrable and valid under the law.

#### A trade-mark muy be:

A coined word, like Calox, Coca-Cola, Omo, Jap-a-Lac, Crisco, Pebeco, Celluloid, Plezo (a trade-mark for suspenders; also for a toilet preparation), Sapolio, Cravenette, Jell-O, Kodak, Unceda, Pro-phy-pacttic, Cres, and Quiso; a symbol (like the Baker chocolate girl), the Prudential Ine Company's trade-mark (which suranc consists of a picture of the Rock of Gibraltar), the Merrimack duckling, the spear of Spearmint chewing gum, the Puritan painter (used on Bay State brick and coment coating), the Ford automobile mark (consisting of a winged pyramid), or the representation of a mask or dom on packages of Crystal Domino sugar), or the painter boy of the National Lead Company; a combination of word or words and a symbol (like Thomas A. on's portrait and signature, used in section with phonograph), a picture of a black cat and the words "Black Cat" ed as a hosiery trade-mark), the trade mark of the Vacuum Old Company (consisting of a picture of a gargoyle, in con-nection with the word "Gargoyle"), or a station of a swan, accompanied by ord "Swan" (used on fountain pens); a portrait (like Mennen's Talcum r mark, which is a picture of Gerhard Mennen), or the portrait of Robert Burns (used on cigars); a word, or words used in a fanciful, non-descriptive sense (like "Cat's Paw," a trade-mark for rub-

ber heels), "Bachelor's Friend" (a suggestive trade-mark for hosiery), the word "Ribbon" (a mark for a tooth-paste), "Republic" (used on automobile tires), "Velvet" (a trade-mark for smoking to-bacco), "Onyx" (the trade-mark of a wellbrand of hosiery), "Ivory" (which stands for a famous braud of soap), "Diaamanes for a ramous brand of seap), "Dia-mond" (a name for tires), "Arrow" (used on collars), "Blue Jay" (a trade-mark for a corn plaster), "Big Ben" (used on alarm clocks), "Lifebuoy" (the name of a soap), or "Occident" (the name of a flour); an historical or a mythological acter like Juno, King William, ewall Jackson, Cupid, Venus (a leadcharacter. pencil trade-mark), Samson (applied sugstively to a brand of rope), or Apollo (the name of a piano-player); initials or arbitrary numbers (like the "G. E." trade-mark of the General Electric Company), mark of the General Electric Company), the number "\$711" (applied to perfumery and tollet articles), "\$\tilde{0}1" (a floor var-nish), "\$\tilde{0}\$. Ke" (the name of a clip to hold papers together), "\$\tilde{0}\$. V. D." (the trad-mark of a well-known line of under-wear), or the big "H" inclosed in a dismond-shaped design (used as a trade mark on Heisey's glassware); the busi-ness name, of person, firm or corporation when written, printed, impressed, or woy en in a distinctive manner, or in as tion with a portrait, or in an antographic form, as, for example, the name "GII-lette," inclosed in a diamond and crossed by an arrow

Marks that may be technically defective are registrable under the ten years' clause if they have been in exclusive use by the applicant for ten years preceding 1905. The word "Faultiess," registered by E. Rosenfeld & Co., of Baltimore, as a tradefor garments, belongs to this class "Faultless" is, of course, descriptive, but it is nevertheless registrable under the ter years' clause. Another mark of the same kind consists of the word "Coward"—a trade-mark for shoes. Coward is the proprietor, and under the act of 1905 his name has no eligibility as a trade-mark unless it is written or printed in a distinctive manner. But his name has been used as a trade-mark since 1868, and, consquently, falls within the provisions of the ten years' clause.

It is easy enough to devise a trade-mark that will comply with the letter and the entrit of the law. But a trade-mark should be something more than merely registrable and protectable. Think of the immense advertising and selling effort that must be brought to bear to overcome the inertia of a meaningless or unsuitable trade-mark.

eed trade-nark should not be A prope dopted until every one of the following questions can be answered affirmatively

- in regard to it: 1. Is it casy to speak?
- 2. Is it easy to remember?
- 3. Is it easy to spell?
- 4. Is it simple in design?
  5. Is it attractive in sound and appear
- anco?
- Is it suggestive of the good qualities of the merchandise? 7. Is
- it different from other trade marks of the same class?
- marks of the same cause?

  8. Can it be affixed to the goods with which it is to be used?

  9. Is it registrable and protectable?
- Competent trade-mark experts ne submit a proposed trade-mark until it has ssed this rigorous examination succe fully. Few trade-marks in commercia une can stand these tests because most marks have been designed without any clear perspective of the part they were to play in busine

As a matter of interest and instruction us take several well-k marks, at random, and not them through the list of test questions.

Opening a current magazine, the first trade-mark we see is "Postum," the name of a substitute for coffee. Postum is easy to say and remember and spell. It is sim-ple, but not particularly attractive in sound. It has no suggestiveness, except the artificial suggestivene

ity. It is distinctive, registrable and is virtually infringement-proof. If the figure 100 should be set down as denoting a perfect trade-mark, then Postum should be graded at about 80. It wholly lacks suggestiveness, and it is neither attractive nor displeasing.

The next mark that attracts our atten tion in this magazine is "Siwelclo, coined word, applied to a flushing devicused in connection with bathroom toilets Siwelclo is not easy to pronounce: it is not euphonious; it is not easy to remem-ber or to spell. It is the reverse of at tractive in sound, and it carries no sug-gostiveness. It is registrable and protects blo

The next trade-mark is "O. K.," applied to paper fasteners. This mark possesses every good feature. It is suggestive in the sense that "O. K." means, in ordinary speech, "all right," "satisfactory," e fasteners are used in offices. symbol "O. K." has a distinct meaning is commercial language. We are of the opin-ion that "O. K." used as a trade-mark for supplies, should be graded 100

"Cat's Paw," a trade-mark for rubber heels, is the next. It is an example of a word that is suggestive in the wrong way "Cat's Paw" suggests the soft quiet tr of a cat—and of rubber heels. At f At firs glance it would seem that "Cat's Paw" is an ideal name. But those who sell rub ber heels say that the noiseless trend (or sneaky walk" as one shoemaker stated it) is the greatest of all drawbacks to the le of rubber heels. In short, the nam

is suggestive, but suggests a defect.

Next we come to "Ralloc," which is the trade-mark of a collar retainer. The word is obviously the word "Collar' spelled backward. It is not euphonious or attractive, or distinctive in any way This mark is an example of a large cl of trade-marks which bear upon them the evidences of only one purpose and that is, to produce something which will no be rejected by the Patent Office

'('rex' is an excellent trade-mark. is an adaptation of the word "Carex." the botanical name of a sedge-like gras which may be woven into a fabric. Drop ping the "a" we have "Crex." This name sticks in the memory; it is easy to spell easy to say, and is quite distinctive. lacks inherent suggestiveness, but it the kind of word that may be readily miarized by advertising

There is a tollet preparation widely advertised and sold under the name "Sem pre Giovine," meaning "always young" This trade-mark must be a tremendous drawback to the success of the article with which it is associated. It cannot be pronounced properly except by those who have taken lessons; and it is difficult to remember. To an English-speaking person it conveys no suggestion. Foreign words should be avoided in devising trade-marks. People do not like to ask for things by names which they cannot

The trade-mark affixed to the liner sold by McCutcheon, of New York, a store famous for the quality of its fabrics, consists of the picture of an old-fashioned spinning wheel, without wording. This is a very good trade-mark. It brings up a mental picture of the slowly-wrought hand-woven linens of our grandmothers' time, fabrics that looked good and wore well

There are trade-marks so admirably adapted to their purpose that they seem to be the work of a genius. "Uneeda" to be the work of a genius. "Uneeda" --applied to crackers in a sealed package, is such a trade-mark. "Rainbow," a trade-mark for dyes is another happy in spiration. This name makes one the fine colors and delicate tones of a rainbow. It stimulates the idea that these dyes emulate a rainbow in beauty "Nkidoo"—a trade-mark used in connec tion with a small gasoline engine launches-is another trade-mark that touches the top notch of merit. gests agility and lightness, and the ability to get in motion and scurry away.

(To be continued.)

#### Notes for Inventors

Shortening a Moving Picture Film.— atent No. 1,032,172 to Ernesto Zollinger of Turin, Italy, discloses an improvement in producing and projecting moving pic-tures wherein he deforms the picture on the film by reducing one of its dimensions to a fraction thereof and then projects the deformed picture through a deformer to reconstruct the projection to its normal proportions. Thus he can shorten up the seture in producing it and when he comes to project the picture on the screen he can lengthen it by suitable means to bring it back into condition to properly represent the subject he seeks to produce

A Man Who Throws Ball to Himself.— Fred H Wood of Elgin, N D., has pat-ented No. 1,030,558, a ball returning device which includes a curved tubular casing into the lower end of which a ball may be thrown, the upper end of the casing being returned slightly and a deflector plate being adjustably disposed with reference to the upper discharge end of the chute so its posi-tion can be varied in order to regulate the angle at which the ball is projected from the discharge opening.

A Domestic Dough Kneader. ssue of July 13th we published a brief note to the effect that somebody ought to invent a domestic dough kneader. A subscriber informs us that such an apparatus is already on the market. It consists of a twenty-quart pail having a bearing for a crank mounted on its top and a depending mixer attached to the crank. This mixer is a pointed finger, curved about one half of an arch, its lower end being about one half an inch from the bottom of the pail. We are assured that such kneaders can be obtained in almost any hardware dealer's

A Home-made Fly Catcher.-In one of our markets the small wholesalers have provided home-made fly catchers on a large scale. On a base board is mounted a length of fly screen-wire secured at its ends and ides to the board and elevated at the middie so the bait, usually fish heads, can be placed below the elevated portion end the base wire inclines upwardly forming an entrance platform and a cover wire overlies the base one, and forms with it a chamber in which the trapped flies accumu-late. The trap is simple and yet effective and attracts considerable attention in view of the campaign against the fly nuisance.

Brick Laying by Machine.—In a recent patent there is provided a machine for building up walls from superposed courses of brick with the interposition of mortar or cement between the bricks of the cours well as between the courses The machine has a rotatable brick earrier upon which the bricks are automatically gripped during a portion of the revolution of the carrier and from which the bricks are released when the carrier has conveyed the brick to its final position. The patent, No 1,033,954, has een granted to Max George Shindler and Linus Paul Shindler of Hamburg, Germany,

Reducing the Noise on Street Curves.— Recently in Washington city a lady secured a judgment against a street railroad company for damage to her dress by the heavy oil used to lubricate a track curve to reduce wear and eliminate the scream-like noise when a car rounded the curve. As a result, the company stopped oiling the curve and the noise at times is almost in-tolerable. Some means, possibly mechanical, may be devised to overcome the frietion between the wheel flange and curved rail and thus dispose of the noise nuisance and also avoid the exec and rail.

A Mechanical Bow for Stringed Instruments.-A patent No 1 034 203 has been granted to Joseph von Peichl of Vienna, Austria, for a mechanical bowing device in which there is a movable carrier provided with rollers and a bow hand traverses the the rollers and forms, with the earrier, a complete bow Pedals are arranged for shifting the bow transversely of the strings s well as for controlling the pressure of the bow band upon the strings in order to se-cure the desired results.

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the investors. Terms on application to the Advertising Department of the Scientific AMERICAN.

## Pertaining to Aviation.

Pertaining to Aviation.

FITININ MATHINE—II. I BERNARD, Mountain Vies (a) This invention combines the main features of an acropian and a helicopter whereis certain advantages are attained in respect to starting and slighting, direction of flight, poising, maintenance of equilibrium regulation of sepect, and general arbett. It is applicable to both monoplanes and biplanes

#### Riectrical Devices.

Electrical Bevices.

ELECTRIC MOTOR E R Wermong, Collece Reprings, lows The motor devised by this
inventor has a rathest when sud an electromagnet and armstur, pasks on the armsturecauge the ratchet tenth which are part of the
parts make and break the circuit.

ELECTRICATIC CELL—A TOMMANIN.

3418 Independence Ave Kanass City, MoThe object in view is to provide an arrangement of means for passing a current of electricity through a solution containing water

resided thereby will be directed to one point

of discharge, and the exigen bubbles will be

directed to another point of discharge.

#### Of Interest to Farmers.

Of Jaierest to Farmares.

FORTABLE ORICHARY HEATER—M B

FITTS, Minneapolis, Kan This invention generates stems and discharges the same along
with hot air and heated products of combus
tion for any destred purpose, but it is particularly adapted for use as an orchard heater,
that is to say, for preventing injury by low
temperature to fruit and other trees, also to
plants and reprotect.

plants and vegetables

BINDER FRUCK—II J DRAGER, R. R. No.

1. Orlando, Ohia This truck is for attachment
to a grain binder, for drawing the latter over
the field or for travel the proper that
from the proper than the proper than the proper travel
frame is arranged at its rear and for pivoid
connection with the binder, and on the front
end is pivoted a tongue and an erweer, and in
the rear of the front end is arranged a
front and the proper than the proper t

#### Of General Interest.

Of General Interest,
ILLIUNINATIDE ENAMELED METAL BARBER'S POLE—F DE PAIMA, 236 Central
Ave, Brookly, N Y This invention provides a structure the parts whereof are readily combined and quickly received; provides
for securing the structure in position, provides means for preventing wear or waste in
cident to supplyment showing on the structure
to impair the appearance thereof, and pro-



ILLUMINATED ENAMELED METAL BARBER'S

Mich access to the interior of the pole. When the post or sign is employed as shown in the illustration as a sidewalk sign the base above the sidewalk is relied and the same is lifted held on the delevables inhimiter of water the sidewalk is the since of the side of the

APPARATUS FOR DISTILLATION.—P. J. MATTENIA, T. J. HINES, and J. J. Bankkar, are of J. Sellamas, Keepon Bidgl. Louisville, Ky This invention has for an object to precure a more refined distillate by renovaling from the product all congeners which are of thow grade and which are voltice out at higher temperatures, thereby producing a more refined product.

reduced product.
PROVERS ON METHOD OF MANUFACTURING ENVELOPS OR BAGS—A. Wasstue, 16 Wolchonk, Moreov, Russla. The subject matter of this invention is a process or
method of manufacturing envelope or bag,
particularly those having threads for opeaing them, which consists in the flaps being
folded around a tightly tendoned thread servting as an abutment.

folded around a tightly tensioned thread serring as an abstract.

NNNREPILLABILE process to provide a comment of the comment o

SWITCH, JOINT—F. G. HATES, SI Ohlo St. Rharon, Pia This joint is for use on devices where it is desired to revoive the device or a portion thereof, the said revoiving movement being substantially controlled by the operator To obtain this, use is made of a body provided with a cap, and means on the hody for revolving the same

lody for revolving the same
NUNPENING DEVICE FOR STORM WINLOWS AND LIKE STRUCTHERS.—J. M.
LIEBMATA, REQ WIRE, Mins This invarious
nection with storm windows, acreens, stc., such
as are removably swung by their upper eads
so as to admit of helps fastesed in vertical
position in a window or door opening, or
swung on tueir supporting means to a position laciliang to the opening.

#### Heating and Lighting

Heating and Lighting.
DRIRE—J. C. Cousins, Marieta, Ga Mr.
Cochurs's invention rolates in general to a
drier, and more particularly to that cleas of
driers known as "hot air driers". The invendriers known as "hot air driers". The invendriers known as "hot air driers". The invendriers the separate driping compartments;
withdraws asturated air from each compartment by means of a fan attachment, and regulates the admission of unsaturated air to the
dwice

device INCINERATOR FOR GARRAGE, ETC.—L. MATTERER, Paris, Tenn A series of compartments is adopted to receive pean holding marents are corresponding with the compartments, one or all of which may be used at a time, the arrangements being such that fumes from the material being indicerated and the graduates of combonation from the fire-boxes are directed into a common set the

#### Machines and Mechanical Bovic

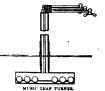
Machines and Mechanical Bevices— AlTOMATIC NHET OFF CONDUIT—1-4-RALA GILLEN, Beckaway Beach, New York, N Y This invention is as automatic shirt and is designed to operate a valve to close and in designed to operate a valve to close add pipe in case of firs, to prevent the con-tents of the pipe or conduit from escaping in case the pipes inside of the house or building communicating with the conduit should be broken of dunged.

broken or damaged.

MURIC LEAF TURNER —C. H BARKETT.

care of Rice & Abbott, Lincoln, Neb. Mr.

larnett's invention relates to music leaf turners, and has for its object to provide a simple, cleap and efficient device adapted to be used in connection with planos, organs, etc.



PADDLE MECHANISM FOR VERSUES.

PADDLE MECHANISM FOR VERSUES.

Baltimore, Mo. This invention provides mechanism for propulsion in challer diversity provides means for reversible, arrowing and composition of the paddies of the seasonal man operated at varieties depths at excellent the propulsive operates without stopping the inflow of water through the picture of the paddies lext.

COMMONECOMORAN

the joints of the paddle her.

WATER IJIT-B. F. SERAROS, 1.—B. F.
D. Victor, Most. This invention is especially
adapted for cievating water to the uplands
for irrigation and other useful purposes. It
provides a mechanism for litting water contiauously from a lower level to a higher one
expecially adapted for use in irrigation. The
finum or ditch may be of any desired construction, the size and length deposeding on the



WATER LIFT FOR IRRIGATING.

country in which the outfit is used. The operation of the ear and the pusher may be constant on the many car may be employed as can be taken care of, the operation affording a continuous supply of water to the upper lavel. The engaving shows a sectional side view of the water source and means of selwation to dis-

#### Rallways and Their Ac

RAIL VOIT.—C. W. Yashuray, 525 W. William St., Springfold, 117 This invention relates generally to a rail and more particularly to a flab plate, adapted for use on steam, else tric and olevated roads, or in mines or quarries, or any place where a construction is re-



vice. The invention provides means for holding adjacent ends of meeting rails, arranged so that holts or equivalent device are not necessary to the provided that he was a subject to the provided by reached to the provided by reached to hold the meeting and so adjacent rails in position and insulated from the readbed, thereby facilitating operation and maintenance of signal systems, which make use of the rail as a parts of the dractit. A side view of the invention in operative positions are the provided to the provided that the p

order.

WELL PACKING.—R. G. BOUTER, St. Marthville, La., care of Hennett Oil Co., Opsicoura,
La. This invention is an improvement in
packings, and has for its object the provision
of a device especially adapted for decop wells,
defined to be operated by a cable or the
feel of the control of the control of the control
when resulted. On cat as a seal for the
well when resulted.

well when required.

ATTACHEMENT FOR SEWING MACHINES,
—H. L. LAIM, 1400 Temont St., Nashvils,
Tonn. The object here is to provide means
adapted to be attached to the stabbing device
of barness evering machines, for channessing
the leather in advance of the etitching mechanism, to provide a channel or groove for receiving and hiding the thread or stitch.

PREUMATIC WEREL.—A. H. SMITE, Top-ton, Pa. The parts of this device being as-sembled and the annular cushion being in-fated, the weight of the uzle and parts cer-ried thereby costs directly upon the timer six-

transferred to i outfled by the the plates, is i



the degree of compression which the annular cushion can underge. The resident a suit a cushion can underge. The resident and at its protected on all sides it can be made succh tainer than times are usually made. The engraving represents a cross section of one half of the when the section of one half of the when the section of the sect

and a solls cushion memory warms are promited matter cushes. WHERL...A. MCKILGO, Alles and the control of the cushes are called the cushes are called the cushes are called the cushes are cushes as the cushes are cushes are cushes as the cushes are cushes as the cushes are cushes as the cushes are cushes are cushes as the cushes are cushes ar



SPRING WHEEL TO ELIMINATE JARRING

invention comprises a bub having a plurality of tubular spokes in which spring-actuated plungers are monated, the plungers being plungers are monated, the plungers being plungers are for a leaf spring connected at chair outer ends each to a leaf spring connected at char end to the holy of a spoke adjacent the spoke at which body of a spoke adjacent the spoke at which work plunger is monated. A side elevation of the whoel is shown herewith partiy in section.

Norm.—Copies of any of these patents will be furnished by the Scientific American for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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We also have associates throughout the world with the activity of the activity

tent Attornope, 161 Breadway, New York, M. K.

vanch Office: 625 F Street, N. W., Washington, D. C.



(19672) G. A. B. sake: If one pours hot water little a glass it to from breaks, while if one piper a spoon in the glass from the beaks, within it one piper a spoon in the glass from it indient does break. One you sell see why the is 1 What is the effect of the spoon in or on the glass that should see with What is the education principle? A. The reason usually given why a plass does not break when hot water is poured into it, if a silver spoon to its of the spoon in the spoon in the spoon of the spoon of the spoon in the spoon of the

the gian, at such the spons server as a conductor of the fact that the spons server as a conductor of the state of the conductor of heat known, and therefore takend from the heat as it would officured in the best conductor of heat known, and therefore takend from the heat as it would collected on the conductor of heat known, and therefore taken heat more quickly than any other content of the present of the conductor of heat known, and therefore taken heat more quickly than any other contents and select. This stock is sever greater than it is a highest because of the equity of contents and select. This stock have any weight. It is an another whose parts have any weight. It is not not to the medition itself, and its heaping it is motion. The rest of the power appears it is not to be medition itself, and its heaping it is motion. The rest of the power papears is useful work. This is threaty but a friedman with the content of the total power to turn itself and do useful work. It cannot over the previous motion? A. The law of gravity is slead in regard to prepared motion. It only specifies the motion of the total power to turn itself and do useful work. It cannot over the proposed motion. It only specifies the motion of the ford provided the point of defying gravity. A vision is a great definition of gravity in the same than the state of the same than the same and the content of gravity is the same of gravity. The law of the point of defying gravity. A vision is a graved definition of gravity is the same and the content of gravity. The same and the content

glaced upon the house. To go into this master the desired is quite beyond the limit of a letter, and provided the second of the weather observe as the station to your winds. The limit of the weather observe as the station in your divident and the provided of the weather observe as the station in your divident as a very moderate cut. Fortunately, there are relatively for facilities to have being for the provided of the provided

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NEW BOOKS, ETC.

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SAFORDE'S MAULL OF COLC. By John Ithial Sanford. New York: Mrs. J. I. Sanford. 100 Fifth Avenue. Svo.; 33 pp.; illustrated. Price, \$1.

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chapter to Baelf For iso short a course, the subplert has been treated in a very sensible and satisfactory manner

STRUBER IN TERREPHIAL MAONETISM. By

Chrose, M.A., F.R.S. New York

The Chrose, M.A., F.R.S. New York

The Chrose, M.A., F.R.S. New York

The Chrose of the State of the Chrose

The Statism's present Prof. Chrose's original
researches in certain branches of terrestrial maginstains, and the work makes no claim to being a
complete teachood of the sublect, or a summary

of estissing knowledge Among other papers of
inner-yeld chaptes, or direct insequalities, on
Antarectic magnetic results, and on comparisons
of Arctic and Antarectic disturbances I is suggestated
in proceedings of the comparisons of the comparisons
of Arctic and Antarectic disturbances I is a general
plate of systematic observations. The invention
of a more secures award conspare in a general
plate of systematic observations. The invention
of a more secures and efficient magnetograph,
from from 'effit,' is greatly to be desired. The
differentiate between various types of sumposite,
and thas to attain to a perception of some definite
resistance, toward the estistance of which relations
into the process of the security of the desired of the
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and than to attain to a perception of some definite
resistance in the process of the security of the control
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Cocker. Chickenser, Erriches & Co., 1912.

BASEBALLOGY. By Edmund Vance Cooke. Chicago. Forbes & Co., 1912. 16mo.; 88 pp. Price, 50 cents.

Idmo.; 88 pp. Price, 50 cents.
These rymes of baseball dea most adequately with "Pan's taste, fan's talk, fan's dope, fan's everything." "Affatuu" is quite shannlessly rhymed with "tonatoes," "buculie" with "baseball-de," and under such disturbed captions as "Metempsychosis" and "Evolution" sppears sum of the most attroctors sings ever heard shout the diamond. The verve and vim of Edmund stanca, and fan—supecially those sufficiently educated to appreciate references to Scorates, Titian, and Antiles—will find many a chuckle in this timely opic of the national game.

FARE MODERTY. By E. B. Lowery. M.D.

advice or not, while the actual plans offered may be summarized in six words. However, had the little books been initised to essentials, we should have lost many pages of dry humor and sensible philosophy, then, no, it is probable that, written in this serio-comic view the little homilies will reach and couvine good fellows who would never dream of attending a temperance lecture or read-ing a book on the

ng a book on diet

ALLOEMENDE VEHERBUNOSLEHRE. Von
Prof. Dr. Valentin Haesker, Zweite
Vermehrte Auflage. Mit einem Titelbide, 135 Figuren im Text und 4 farbide, 135 Figuren im Letten und 4 far1912 M-10- in Leitenbaufd MilleBraunschweig: Verlag von Freidr. Visweg & Sohn.

weg & Sohn.

This book presents to the biologiet, the physician, and the animal breeder results that have been obtained after twenty-driv years' of investigation of the property of the prope

It has med in Germany.

HANDBUCH FOR HERR UND FLOTTE. Enzyklopädie der Kriegswissenschaften und
verwandter Gebiete. Herausgegeben
von Georg von Alten, Generalisettnant z.
der bedeutendsten Fachautoritäten.
Volkstandig in 108 Lieferungen reichillustrierten Tottes mit farbigen Beilagen,
Karten, Planen, Gefechtsskuzzen usw.
Lespzig: Richard Bong & Co., 1912.

Lesprig: Richard Bong & Co., 1912.
Installments 41: 0.4 of the Handbook for Arms and Navy treas the subject from Maximilian I to Napoleon I Among the stricke that should be particularly mentioned are those on the warn of the Swedon Francisca and Poleo for the Domestion of the Battle provinces, and the Thirty Year- War This last subject is discussed on the basts of entirely new investigations. Most inter-exist the Great General Count Schilfren has discussed and the basts of entirely new investigations. Most inter-exist the Great General Count Schilfren has discussed atmirably the Napoleonic campaign of 1900-1907. There are twenty-five accoulent war masses on which may be found every geographical may be compared to the Great Country of the Country

THE EVOLUTION OF ANIMAL INTELLIGENCE, By S. J. Holmes. New York: Henry Holt & Co., 1911. 296 pp.

Hott & Co., 1011. 206 pp.
In this book the reader will find summarized in a very popular and interesting way the main results of recent psychological and chemical study of asimals. Look's work on tropisms is committed to be, since it is actions attending to explain type chemical action alone movements hitherto rather vaguely searched to instance. To the psychology of animals the author has dreds it are considerated to the control of the

Heredity in Relation to Eugenics, By Charles Benedict Davenport. New York. Henry Holt & Co., 1911. With 175 illustrations and diagrams, and com-plete bibliography and index. 8vo.; 298 pp. Price, \$2.

Valenc Cooke's well-known style pervades every latename, and chargements, those sufficiently asked and the strategy of the heating against this timest upon of the national games.

Filter Monkey. By E. B. Lowry, M.D. Chicago: Forbus & Co., 1912. 16mo.;

I 10 pp. Price, 50 cents.

"Pakes Monkey' is a little volume of instruction of the control of the strategy of the control of the



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ainces, you will find it in Exhibition Balloons.
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#### The New Serum Treatment of Bleeding and Hemorrhage

By Dr. Leonard Keene Hirshberg, A.B., M.A., M.D. (Johns Hopkins).

T HAT the injection of fresh blood horse serum, which rapidly controlled the serum is a potent factor in controlling certain types of hemorrhage where there is a delay in the clotting of the blood, has been reported by a great num er of scientific investigators.

The treatment of hemorrhage depende upon two factors: First, the use of drugs for their action on the blood vessels; secondly, agents used to promote the clotthe blood itself. Many different ting of the blood itself. Many unnerem-kinds of drugs, whose value depends upon regulating the tension of the blood vessel have been used Among them are the saits of calcium, strontium, magnesium, and solutions of gelatin.

In 1910, an investigation of the causes of twelve cases of hemophilia, which is a certain type of disease with continuous emorrhages, were published. lation or clotting of the blood was long delayed, in all of these cases and in those patients who showed the most marked clotting or coagulation re quired an hour or more.

Two forms of hemophilia were discov ered, the accidental or transitory, and the congenital variety which appeared at birth. In the former the blood was thin and flowed rapidly through a needle in-serted into a vein. In the latter, the blood was found to be sticky and it flowed slowly, very much like molasses. Experiments with blood were carried on, showing that if three drops of animal blood serum were added to three cubic centimeters of blood in either class of patients, the coagulation of blood took place promptly and hemorrhages ceased. They also discovered that the same effect could be produced by internal injections of the d serum. The serum of a man, rabbit, horse, or ox was all found to effect quick clotting of blood, previously con ductve to hemorrhage. The value of this finding is appreciated, when it is realized that bleeders or "hemophilics" are as common as club feet.

The serum was injected into a patient efore the extraction of a tooth, and dur ing an operation upon an abscess, and it successfully prevented every vestige of hemorrhage. As one doctor says: "Fresh serum is an effective remedy for the ar-rest of hemorrhage in all cases of blood disease. It is more effective than any general bleeding "

In applying the use of the serum, large doses must be employed, and that while any serum may be used, that of the ox or goat should, if possible, be avoided, since it has the power to produce toxic symptoms of a serious nature. The use of injections of animal blood, to prevent hemorrhage is permitted only in cases of real bleeders disease called "hemophilia." Many failures were reported due to attempts to apply blood serum to other dis

An eminent scientist at work on this problem says that an injection of fresh erum is the most efficient means we have the treatment of hemophilia, but if it is not at hand, regular antitoxic serum. whether diphtheria or lockjaw antitoxins, may be employed, and answers just as

There is a case of a boy of fourteen ears who always had hemorrhages from the nose and gums which failed to respond to the treatment of injections of gelatic solution, but which stopped when injec-tions of diphtheria antitoxin were applied. There is another case of a newly-born infant who had hemorrhages from the mouth and nose. The infant was bleeding, will be soon placed treated by applying sponges dipped in modern wonders of the world.

#### Can the Baser Metals Be Changed to Gold?

THE newer scientific contributions from ponder deeply in a high attic, evolve some the physical, chemical, and electrical kind of a theory, and then discover only laboratories, work from discovered and such facts accorder to their pet theory. confirmed facts to widely applied theories.

This is in marked contrast to the science than the man in the street is willing to of the schoolmen and the ancients, who gather it is a contrast that many begain

Here is a typical case of hemophilia.

A child, who was in a very poor condi tion as the result of a steady loss of blood following the extraction of a molar tooth, was treated by the application of astringent medicines, but they proved solutely useless, so it was decided to try the administration of serum. Normal minutes the oozing blood became les less and the bleeding stopped. There was a recurrence and relapse, however, and another injection of horse serum was given the following day. At once the nemorrhage ceased and did not reappear any more.

in treatment of hemophilia is afforded by a New York pathologist. He injected nor mal human serum in the treatment of nine babics. He believes that all of these babies would have died under any othe treatment.

tained by different workers:

1. The congulation period in hemo-philic subjects or "bleeders" is greatly shortened by the injection of fresh serum.

2. The local application of fresh serum. in wounds, in patients in whom there is a delayed congulation of the blood, acts

3. The scrum of any living animal spe cles is efficient in producing this phe

as a presentive of hemorrhage.

omenon of clotting.

4. The sera of the ox and dog should be avoided if possible, because of the toxic symptoms frequently attending their use

5. Regular tetanus and diphtheria anti-toxic sera are less satisfactory than freshly drawn material, but do very well

an emergency.
The difference between antitoxic and fresh sera may be due either to age of to the presence of the preservative drugs which the former always contain. reports that antitoxic sera have been effective in some cases and disappointing in others is due to the fact that age or drugs act as a retardant to clotting. The inactivity of the sera probably depends upon the changes which they undergo

with age.

The belief that the action of animal or human serum in increasing the coagu-lation of blood in hemophilic subjects depends upon the substitution of an active lotting agent is, therefore, based upon the following facts:

The rapidity and completeness of coagu lation is directly proportional to the amount of this complicated clotting agent found in the serum that is introduced.

This agent is called "thrombin," and is about the same as the pepsin in the stomach.

Experience shows that relatively large amounts of serum must be employed to produce definite results. That is to say to stop bleeding in anyone, it is essential that large quantities of new blood serun be introduced into the veins of the on who is suffering the hemorrhage. worse than useless to give a little serum a great deal or none at all must be given

To Dr. Alexis Carrell, Prof. William H. Howell, and Dr. Crile, all young An can scientists, the public are indebted for overles that have lead up to this great new method of life-saving. With anti-septics, antitoxins, anesthetics, aero-planes, spectrum analysis, radium, X-ray, wireless telegraphy, telephones, the Puna-ma Canal, and synthetic chemistry, the serum treatment of hemorrhage and bleeding, will be soon placed among the



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ful "self-made" men do not see. The investigations of radio-activity and electrons, have proved beyond cavil that he elements are not immutable. They are essentially all alike at bottom, and are made by an evolutionary process.

It is known to every high school student that the element radium, spontaneously disintegrates into two other elements; one a heavy, inactive gas called niton, and a lighter gas called helium. In turn, after niton has emanated from radium, it changes into helium and a solid element, until recently called radium A. Radium A also undersed distractors.

A. Radium A also undergoes disintegration into other elements, and so on of signitum. Each one of these breaking down experiments sets free enormous quantities of energy; enough, in fact, to make electricity for a large city. It has been carefully exclusized by Sir William Ramsay and his co-workers that the decomposition of one cubic centimeter—about; a thimbleful—of niton, is accompanied by the evolution of some four million times as much heat as is obtained by burning an equal amount of gas.

It is thus clearly apparent that as each element and its atoms disintegrate, they unlook and liberate a reservoir of potential energy so immense that the finite mind of man cannot grasp it. Once this vast effort of nature is realized, it will begin to be faintly understood, how much power will be necessary to generate the excessively high potential requisite, to change or transmute one metal element into another; base tin into wingin gold, as the alchemists attempted. The only energy of this sort available is that given out with the natural breaking up of nition and the other radio-active elements; and even then because of the long periods required, the slowness of the change, the transmutation even if possible, only infinitesimally small particles of elements avoid over the transmutation even if possible, only infinitesimally small particles of elements avoid over the transmutation even if the statement of the second of the statement of the second of th

Sir William Ramsay recently performed certain experiments in this direction on distilled water and nitron. Mr. Cameron assisted him in this work. Distilled water, upon which a very small amount of nitron gas was allowed to act, was placed in a sisilia glass tube. Then the gases which resulted were removed, and examined with a spectroscope. Hydrogen, oxygen, helium, neon, and nitron were found. They concluded from these experiments that the transformation of nitro neon in the presence of distilled water as indisputably proved, and, if a transmutation be defined as a transformation frought about at will, by change of conditions, "then this is the first case of transmutation of which conclusive evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward, "Dr. Ramsley evidence is put forward," Dr. Ramsley evidence is put forward.

say writes.

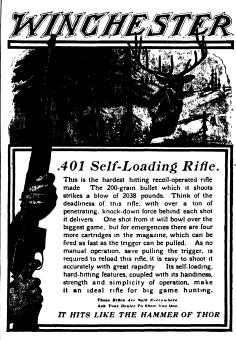
Sir William Ramsay and Mr. Cameron no longer maintain in the face of Madame Curie's disproof, that lithium can be transmuted from copper. The work of Sir William Ramsay with Mr. Usher on the action of niton upon solutions of lead, thorium, titaulum and silicon, where carbon was always previously excluded, showed the presence of carbon dioxide every time. Chlorate of bismuth and zirconium solutions, showed carbonic acid gas also when acted on by niton.

gas also when acted on by nitcon.
But in no case so far discovered, was an element obtained by such transformations that were heavier than the elements from which they came. No experiment has yet been successfully carried out by Sir William Ramsay or by any other physicist, in which an element became changed into one of higher atomic weight. Even criticism of such transmitations as have been obtained, were made. Ratherford held that the seen and argon found, might have come from the glass or leakage, but the quantities reported certainly

ford held that the neon and argon found, might have come from the glass or leak-age, but the quantities reported certainly disprove any such possibilities. Loath as we have been to give a place in inodera chemistry to the doctrine of transmutation of elements, little as we care to seriously consider attic theories, dogmas dear to the hearts of the advocate, near-hew philosophy, or chemical divining rids, none of us can dany these established, laboratory facts, repassedly confirmed by mabband archimenters.

unbiased experimenters.

Hence, the velatile imaginings of that vapory over of passide chamists of the



## **AVIATION**

- Two topics are of paramount importance just now in aviation. The one is the possibilities of the hydro-aeroplane—the flying boat in popular parlance—and the other is the flying machine as a military weapon.
- In the forthcoming mid-month September issue of the Scientific American, which will issue on September 14, these two subjects will be authoritatively discussed.
- ¶ Mr. Carl Dienstbach writes on the hydro-aeroplane. He points out how important is the development of the flying boet, because at last we have a vehicle of the air which is sale and which means much for the advancement of flying as a sport.
- ¶ Major Bannerman Phillips of the British Army, a noted European authority on the military aspects of aviation, will write on bomb-dropping. He will show how much or how little is to be expected by dropping high explosives on an enemy's force from a height of half a mile, basing his comments on the achievements of aerial grenadiers in the Tripolitan campaign and on the results of the bomb-dropping contest held in France.
- ¶ Dr. Alfred Zahm, America's leading authority on aero-mechanics, will show in a popularly worded article what has been the development of laboratory work since the day of Langley. If the flying machine is to become a really practical vehicle of the air it must be developed by the same methods that have given us giant bridges, huge dynamos, highly ramified telephone systems. That is why Dr. Zahm's article, dealing as it does with investigations made by engineers and physicists, is of immense practical value.
- If There will also be the usual Scientific American features the short pithy articles on current scientific events, with many bright illustrations of the latest inventions and scientific apparatus, the latest news for inventors.
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Middle Ages, although founded upon vain dreams and their illogical yearsing for a philosopher's stone and an elistic of life, the modern physicists now stead sponsor to the ghostly nothings of medieval

## The Aeroplane in the Military Maneuvers

(Concluded from page 154.)
above a height of 2,000 feet. If the barograph showed that they had dipped below this level they would be counted out, having been theoretically shot. German regulations place the safety zone above regulations place the sarety zone above 2,800 feet, and French regulations above 8,000 feet. Considering the fact that the men had to use both hands for the control of their machines, and, therefore, could ot employ field glasses to study the country beneath them, the reports they turned in were marvelous in detail and accuracy. Lieut. Foulois, for instance, in his recon-naissance of August 13th. left camp at 3.58 A. M. and returned to camp at 10.28 A. M. The report he brought back covered two typewritten pages, and gave the location of thirteen different military bodies. All the time he was making testa with his aeroplane wireless set. tual messages were sent, but various letter signals were transmitted, for the purpose of attuning the instrument. Lieut. Milling also brought back a very complete report, which was even more de reason that he was not handicapped by attention to a wireless telegraph instru-With his high speed machine he made the circuit in a little over an hour and brought back detailed information that would have taken half a day for an entire brigade of mounted scouts to have collected As yet the relative accuracy of the report obtained by mounted scouts and those obtained by aeroplane scouts have not been made public. However, the chief umpire knowing the exact position of every detachment was able at once to confirm the accuracy of the aeroplane reports.

The officers have expressed the as highly pleased with the work of the aviation squadron. It must be borne in mind that the country over which these operations have been conducted is the most difficult flying country imaginable. There is no level ground anywhere. It is so cut up with valleys and gorges that the air fairly boils with unexpected gusts of

Although Mr. Haven is an accomplished and daring aviator, his work so far, as a scont has been very disappointing. While the other scouts have brought back two page typewritten reports, he has been able to discover practically nothing of value. It has been urged that the United States Army does not need to go to the expense of establishing an aviation squadron for the reason that there are so many experienced aviators in this country who could be hired in time of war to do the scouting for the army, and if they were unable to report any information themselves, they could at least carry a passenger with them. The present maneuvers show that the carrying of passengers is by no means feasible under all conditions, and unless the aviator is able to make a detailed re-

port, the army is likely to suffer from lack of important information. While the aviation squadron has done splendid work under the peculiar ea tions encountered, nevertheless the fact has been clearly demonstrated that what the army requires is a well-trained corps of sylator econts with machines not no or aviator scouts with macaines not neces-sarily of high speed, but certainly of large carrying capacity, which will be capable of rising from the ground under the most adverse conditions. It is quite essential adverse conditions. It is quite essential that a machine entry a passenger because it is impossible for a man to pilot a machine and keep track of all that is passing theneath him, trusting to his mechaty largely with only an occasional opporwords of memorandum

of the practice of the service can be fully developed, it will no doubt result in great woman, for it will make it managed.

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In some diseases the spinel fluid is much more active as a destroyer of the adversalin than in others. Thus the spinel fluid from a patient suffering from infantile purelysis is quicker in its action than the spinel fluid from one having disponence maningtis. This fact may large out the first part of the property of

ing the swalty free for fighting purposes only. Of course in these maneuvers the aeroplanes have had no enemy ju the air to-contend with. During the first half of the maneuvers, that is, in the instructional period, the aviation squadron was neutral. After that the machines were neutral. After that the machine divided between the two armies. were perfectly safe from attack as long as they kept above the danger zone, but in time of war no doubt they would have to contend with aerial sharpshooters.

The work of the wireless set on board Lieut. Foulois's machine was purely experimental, and nothing much was done. The instruments he used were selected and installed by himself on the machine. all generator capable of developing 250 watts was driven by friction gearing from the flywheel of the engine. He used the wire bracing of the aeroplane for a counterpoise, and for his antenna he counterpoise, and for his antenna ne em-ployed a suspended copper wire 300 feet long. This he paid off from the machine gradually after he had reached a suffi-cient elevation. His sending key was ated to one of the operating levers. The only one available was that on the left hand side, and it was necessary for him to send his signals by operating the key with his left thumb. This was exkey with his left thumb. This was ex-ceedingly awkward, and the signals he sent were certainly not of the best. Nevertheless, they were clearly picked up by the wireless station at headquarters n when the aeroplane was over twelve miles away. When landing, Lieut, Fou-loss clipped the wire before it had come within reach of trees or other obstruction within reach of trees or other obstruction on the land. The release of the antenna was effected very accurately, and it al-ways dropped within a prescribed area, so that it was readily recovered.

#### Antagonistic Body Juices

THE substance produced by the "supra-renal capsules," small bodies lying just above the kidneys, plays an important part in the workings of the higher organisms, since death quickly follows the removal of these bodies. At the same time, the capsules these bodies. At the same time, the exact function of the substance is not known. If a small quantity of the adrenalin, or exa small quantity of the adreadint, or ex-tract from one of these capsules is injected into the blood, there is a quick rise in the blood-pressure. This is brought about by the contraction of the muscles of the smaller arteries. The effect lasts but a few minutes, however, and at the end of that time it is quite impossible to discover a time it is quite impossine to discover a trace of the adrenalin in any part of the blood. What becomes of the adrenalin in that short time is a complete mystery. Many poisons and other foreign sub-

Many poisons and other foreign sub-stances are destroyed or neutralized di-rectly by the blood, but that is not the case with adrenalin. If a small quantity of the substance is mixed with blood and the mix-ture is allowed to stand, the adrenalin may still be discovered the next day. Neither is it destroyed by any sers. Within a very short time, however, Dr. S. J. Matteer of the Rockefeller Institute has discovered that there is a body fluid capable of destroying adrenalin. Dr. Melster had an epportunity to obtain quantities of spinal fluid from a number of patients suffering from various diseases.

quantities of spinal fluid from a number of patients suffering from various diseases. In all cases the adrenalin was destroyed by the spinal fluid within an hour, if kept at the temperature of the blood, If the mixture of the two fluids was kept in an ice-box, however, the adrenalin was just as now, nowever, the end of a long time as it was active at the end of a long time as it was when first prepared. One pact of the advenalin was mixed with twenty parts of advansils was mixed with twenty parts of spinal fluid, and one half eable centimeter was used as a test, the effect of the mixture upon blood-pressure in a free being an indi-cation of the activity of the advensiln. If the mixture is kept warm, even four times the normal does produces no effect at the end of an hour. MACHINES

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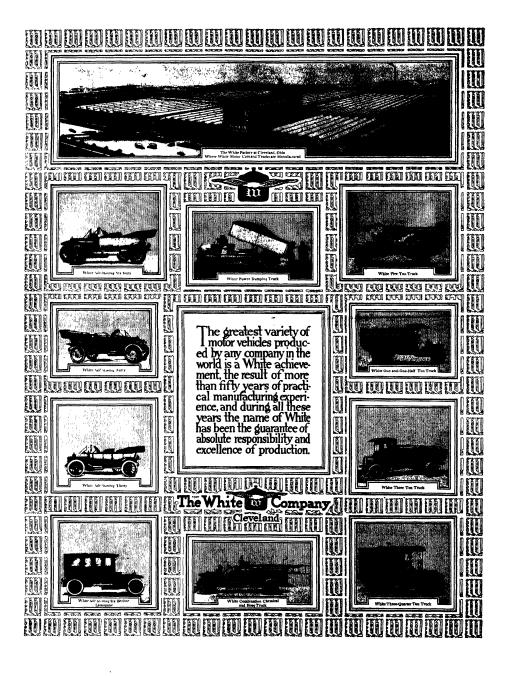
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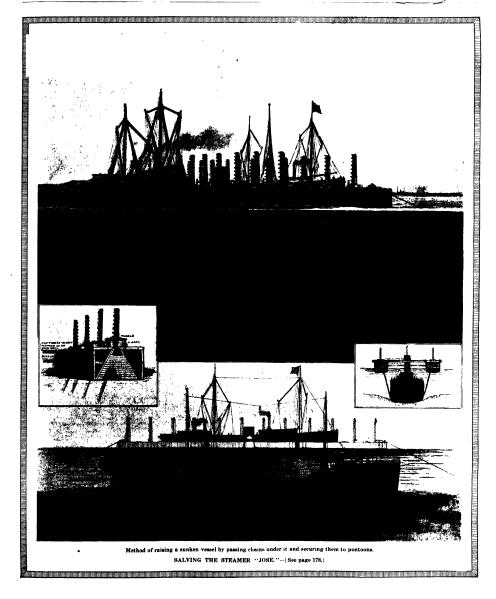
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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Relative Sea Strength of the United States

COMBING to the latest sedinate made by our admirable diffect of Nava Intelligence of the Navy Department. The United States has a linearly yleided the position of second in naval strength among the makes of the world to Germany. This is true, even if we take into condeteration butteships at ready built, and it is startlingly true, when we consider both the lattiteships built and thouse under construction. At the present time Great Britain possesses fourteen buttleships of the dreadmonght type, commany dark, and the United States sween, Great Britain has eleven such ships under construction, Germany dark, and the United States sween, Great Britain has eleven such ships under construction, Germany other and the United States is sween, as the Conscience of the Construction, Germany and the United States is such as the "Conscience", "Germany would be such as the "Conscience", "Germany twenty as a superiority of five ships of this class over Germany. The pre-dreadmonght buttleships, however, because of take's inferiority in speed and gum power will be at a great disadvantage when they come to lie in line of battle against the modern ten- and twelve-gum dreadmonghis. Even on a basis of the total tomange of all ships completed, Germany still has a decided lead over the United States. Great Britain heads the list with 1.888-44 tons, followed by Germany with 787,790 tons, the United States. When we come to consider the vassels which are now.

When we come to consider the vassels which are now under construction, the great activity of Germany and the comparative functivity of this country produce a marked difference in the comparation. If all vessels now building were completed, Great Britain would lead with 2.480.78 tons, and the United States would be second with 1.180.28 tons, and the United States would be hird with 0.4574 tons. Funce would come next with 804.231 tons, and Japan fifth with 015,083 tons. Of dreathought built-delile and Britie cruisers combined, Great Britain would possesse thirty-olfs, Germany, twenty to the contract of the production of the second production of the british strength of Germany, and Just one third the strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third the derendought strength of Germany, and Just one third

In the presence of these figures, it is simply bowlidering to attempt to understand the attitude of the House of Representatives in its attempt to probliff the construction of more battle-ships. In one slingle week Construction of more battle-ships. In one slingle week Construction in the terminal that the problems of a treaty, the ink of whose signaturers is secretive vet day. Sattesmanship of this kind can secretly be called partie. If it is the policy of Congress to tent up treaties and ere "hands off" from the only promising held remaining for colonial exploitation, this policy should surely be backed up with those armed forces which are necessary to render it more successful. We believe there never was a time when the United States so greatly needed a strong many as she does at this critical stage of her progress toward been ultimate dominant position among the world world.

#### America's Need for an Aerotechnical Institute

THE inventors and builders of air craft in this country feel keenly the want of experimental data to form a rational basis for their structural designs; the users and students of air craft experience

an equal want of adequate and disinterested comparative tests of existing carft, appliances and accessorian. There is, therefore, a general desire for an American aeronautical institute that shall meet these wants in the broadest and most thereogia manner, an institute not for training aviators or instructing engineers, for this is already done in several places, but primarily producing and disseminating aeronautical selector.

not not training avances or instructing engineers, two this is already done in several pitone, but primarily for producing and disseminating aerosautical science. In European countries some excellent inboratories for aeronautical research are privately endowed and conducted in the interest of dvil science and construction; others having governmental support are intended primarily to subserve a military purpose and may not be readily available, if at all, for dvillien use. The latter kind are, at present, not strongly demanded in this country, wither by the army or the navy. Hence, if a federal appropriation for the advancement of aeronautical science he made at all, it should be alloted to one of the civil establishments, such as the Bureau of Standards, or the Smithsonian Institution. The latter can reveive both private endowments and federal grants, has sufficient building space, an aeronautical library and the old Langley workshops, not to mestion the Hodgkins fund of \$100,000 for studies of the amosphere.

If an aeronautical institute were privately founded it should have an endowment equal at least in purchasing power to the best in Europe, say twenty to thirty thousand dollars a year; its directorate about dichide representative men alert to the needs of aero science and industry; it should be practically independent in its finances and government, or if affiliated with a great seat of learning, should not be dominated by the president or teaching corps, or in any sense made a dependent of, or mere adjunct to, some scientific denormants.

Whether established by private means or governmental, or both, what our people require is a representantive American institution "in which a staff of trained specialists, provided with adopate apparatus, shall furnish physical constants, laws, formula, and empirical shat of substantial and permanent value to the equitiver, the inventor, the manufacturer, whose correctes should remain free to employ such knowledge to the advancement of important industrial aris; a historitory where complete and reliable tests and reports shall be made upon all classes of actual air craft that may be worthy of study and development; an institution surrounded by ample muneuvering space of and and water, and preferably adjacent to a governmental flying ground, availables with hangars and shops, to all civilians worthy of assistance; a center of sciencial activity, whore at all times may be witnessed the most accurate researches and most exhaustive tests; where the knowledge sos gained shall be disseminated by publications, by oral communications, by exhibitions of apparatus and interminents, of materials and models, by photographs and drawings, in a word, by all the facilities of the servotrone, the

abov room, the library, and the secondly room. The foundation of a national inetitie to comprehensive and thoroughgoing would greatly promote a direct and universal mode of hocomotion, and would constitute a mountent fit to bear the name of the most numificent patron of science. But unless an individual will endow such an institution adequately to meet all conjunctions for many years, it will be better for the votaries of aerosautics to initiate an establishment comprising such buildings and endowneut fund that it shall be capable of ample growth by the cumulative contributions of many individuals or associations, and by occasional grants from the federal government. Better no serotechnical institute than one to mesegely furnished with men or resources to meet the practical needs of the community and to make substantial contributions to the science in which America once enjoyed leadership.

Hon. W. G. Sharr, in an able appeat to the House of Representatives for the encouragement of a ristion, recommended an appropriation for an aeronautical absoratory, and the Acro Chiu of America has, with the Indorsement of prominent scientific bodies, plesqued itself to secure the endowment of such an establishment. The Scientific American commends the movement most heartily.

#### The Possibility of the Oil Engine

THE internal combustion gasoline engine is being developed as much in the United bitates as elemented where, and the Junkers oil engine, the most recent challedge of the reciprocating heat motor, may be expected to have a great career on this adds of the Aliantic. Occasional oil engines in electric central station service—Diesel engines—are airasely reported, and any class of engine from attendant can operate them successfully.

them successfully.

For marine propulsion also, who knows but the statuch ships that will some day be launched to revive the aucient glory of the American meschant marine will be equipped with oil engines. Our own fuels and

them of burge and any will supply the service of the process, with the great off facility of their process, with the great off facility of their process, of globe to full back upon, including the same are upon to Borneo. Oil is the seating fuel for proceeding the same are processed in point of classification of the same processed only being higher as the dies of the same be included in the processed only being higher as the dies of chapt the processed in the processed in the processed of the same of the processed in the processed in the processed of the processed in the processed of the processed of

#### The Needs of the Bureau of Chemistry

LiAT shall be said of the powerful division chiefs in the Bureau of Chemistry, who, chiefs in the Bureau of Chemistry, who, chiefs in the Bureau of Chemistry, who, in the courts of the courts to bring dishonest food manufacturers, criminal dispenseers of injurious beverages, and adulterers of healing drugs to book? And what shall be said of, a government that permits a Higelow, a Kebler said a Doolittle to squander public money in worthless analyses and to bring actions that any open-minded lawyer must know are futile? Only the press can rouse the public to a sense of the grave risks incurred by the maladministration of the Pure Food and Drugs Act for which these three men are largely responsible; but the public press knows nothing of sclence and publishes nothing but praise of the input officials who control the Bureau of Chemistry.

The organization of the Bureau is in part respon-

The organization of the Bureau is in part responsible for a situation which has made scharific work almost impossible. At present those who are charged with the investigation of food and furge products are subject to the authority of Bigelow and Kebler, of ordering the state of the Food and Irrups state. What could be more admirble? In not this the practice of every maninfacturing establishment? It so happens, however, that the Bissourie of the Food and Brups state which the state of the Food and properties of the Food and present state of the Food and Brups state. What could be more admirable? In not this the present of every maninfacturing establishment? It so happens, however, that the Bissourie will be a department story, where whe a expansion land present well, but a scientific institution, intrusted with highly important investigations that conservativery man, woman and child of the finitely million people who constitute the population of this country. And it so happens that the division of the country and its observation of the state of the state of the state of the state of the present the state of the state of the present that the division of the present that the division of the present of the

Under the present system the subjects for investigation are assigned to subordinate officials by the very division chiefs who are evolutually to prosecute mannfacturers guitty of fraud. The success of the division chiefs in court depends on the scientific findings of those who are assigned to the cases. If the division chiefs were men of any scientific standing, men who cared only for the scientific facts, the system might still be effective. But, caring chiefly for prosecutions and little for scientific truth, at can be insagined how little they care for research. The public is vitally interested in the proper enforcement of the Pare Food and Drags Act, and consequently in the scientific investigations of the Bureau of Chemistry.

Waste in Feper-making.—Chemists attribute the great rise in the price of all sorts of paper in recent years largely to wasteful methods of manufacture, which for the most part the milli ears little or nothing about checking. One well-known chemist said the other day: "Some years ago I made a contract, after much trouble, with a large paper mill. The first thing I did when I want to work was to colicits unampies of all thick waste wasters and determine the amount, proportion and kind of material that was going into the stream. This mill had never paid, though it was well incated. One reason for this that was proper before the strainers to pay a dividend, I found, we like I'l per cent of the product was floating off down the next of the product was floating off down the chiral paid the manager about it. Will, he judit my salarly for a pay, and never allowed me to joint judy the mill againty for a pay, and never allowed me to joint judy the mill again; and the mill again, the mill again, the mill again the mill again.

#### Electricity

Classification of Windows Telegraphy at Sea.— The new Grand Impediation, requiring all German passages interaction over the company of 75 persons, including the own, to be outproped with windows telegraph appearating of a transitioting redius of 100 naurola miles, will go his discover to the company of the control of the Company of th

brunn, Acces, 19th, Pengg, Aengst and others.

Brederic Effer-electric Development in 1911.—The
newly-erected hydraulic plants in Sweden for the last
year amount to nearly 40,000 horse-power, and to this
in to be added the extension made in the former plants
during the year, which makes a total increase of 67,607
horse-power as against 62,285 for the precoding year.
These figures relate to electric power plants installed
by private companies. The height of the fall which
is used here varies up to 240 feet, and in general it is
under 80 feet. under 80 feet

A Large Electric Plant in Brazil.—A company has recently been formed for the purpose of constructing an electric power plant in Brazil which will be one of the largest in South America. The hydraulic station the largest in South America. The hydraulic is to be located on the San Francisco River River and the us to be considered on the Sani Prancisco ktiver and the power will come from the Alphonos falls. It is stated in the Frunch technical journals that the size of the plant during the initial period of operation will be about 200,000 horse-power, but at a later date the station may be extended so as to produce as much as 1,300,000 horse-power.

Pekin's Telephone System.—The telephone service of Pekin has been commenced by the installing of two central exchanges which are laid out for a total of 6,400 subscribers. There are about 3,000 subscribers in the Chinese and the Tartar quarters, and the remainin the Chinese and the Tartar quarters, and the remain-ing quarters are to be wired up at a no very distant period. It is to be noted that the two exchanges are constructed by the government and are now being operated by it. The legations already had many private elephones, and these are now conn

exchanges. Wireless Telegraphy From Balloons.—A German experimenter, H. Mouler, has devised a method of using wireless telegraphy upon spherical balloons. He places a wire around the balloon body so as to form a vertical loop, also a second wire banging down from the haslest. More recently he has found it best to attach the loop wire to a band of sout centres and then tach the loop wire to a band of stout can vas and then to lay this around the bulloon bag so as to attach the band to the network and avoid putting the wire directly upon it as this might cut into the balloon. It is much better to have the loop lying to one side and not directly over the center, so that the wires coming together into the basket are away from the gas valve and are less likely to the control of the control of the control of the sake of the control of t likely to cause a fire.

Bisettle Steal Production in Norway and Sweden.—
In Norway and Sweden there is considerable activity at present in the way of electric steel production. There are two new steel works with electric furnaces shortly to be erested which propose to turn out 16,000 tons annually during the first period, and this will no doubt be increased later on. One of these enterprises is carried on by the filteraper Steel Company, which is capitalized at \$1,200,000, and it is now arranging to secure 2,500 horse-power in electric current from a local hydraulic plant. The new works will include an electric furnace of the most recent design for steel production, with a Electric Steel Production in Norway and Sweden. plant. The new works will include an electric turnace of the most recent design for steel production, with a rolling mill, steam hammers and foundry for steel casting. It is expected to turn out annually 1,600 tons of rolled steel, 300 tons forged steel, 600 tons cast steel, and 700 tons diverse. The second enterprise consists of an electric steel plant near Arendal and it will use current from the Boilejos hydraulic plant.

The Electric Furnace and Ferre-silicen.-The electric The sisectic Furnace and Ferre-suiton.—In electric furnace process can be used to a great advantage in obtaining compounds of iron and silicon or ferro-silicon, and it is even possible to, produce pure silicon in this way. The usual blast furnace methods are said to give and it is even positions to preceive pure smooth in this way. The usual blast furnace methods are said to give a maximum of only 20 per cent silicon in the compounds obtained, but much more is given by the electric process, and others are much less than the contraction and others are much less than before. It is noticed that ferro-cilicon containing less than 20 per cent or more than 65 per cent are scaling the composed. Prom a chemical standpoint it is admitted that there are at least three different fillides of iron, and perhaps two others. The present process is new being operated in Regrops and is covered by patents, the decirio furnace comparths; resembling a calcium carbide furnace, but it is being that a large-scale furnace in essential to obtain the proper results. Such must also be operated may be a consistent of the proper results. Such must also be operated face to the process of the process of the proper results.

Drinking Cups For Herses.—The New York Bureau of Municipal Research announces that hereafter indi-vidual drinking cups and shower baths are to be used. The Bureau points out that among the 90,000 horses that perish every year in Manhattan no less than 6,500 succumb to glanders which is communicated by filthy

The Death of Schlever .-- On August 20th there died at Constance, Baden, Johann M. Schleyer. In 1879 he invented Volapuk, an artificial language that was as much spoken about in its day as Experient is now. His Volapuk was the first artificial language that attained any measure of practical success. When the third Volapuk Congress was held in 1889 two hundred and eighty three societies had been formed in various parts of the

Prof. Frost Receives a Degree from Cambridge. Prof. Edwin B. Frost, the director of the Yerkes Observatory, while a delegate to the 250th anniversary of the Royal Society was given the honorary degree of D.So. from Cambridge University. Prof. Frost wil spend the year abroad in England and Germany. In his absence, Prof. S. Alfred Mitchell will be at Yorker ervatory, having been granted a Sabbatical year for that purpose by Columbia University. Prof. Mitchell is well known to our readers from his contributions to the SCIENTIFIC AMERICAN on astronomical subjects.

Barring Insects.—On August 10th the House of Representatives passed a bill introduced last May by Representative James 8. Simmons of Nagara Falls, N. Y., regulating the importation of plant products Under this bill it will be unavful for any person to import into the United States any nursery stock except under permit from the Secretary of Agriculture and under conditions and regulations prescribed by him. The United States is the only great power without proction from importation of insect-infested or diseased ant stock. Diseased livestock is excluded by law, plant stock. Diseased livestock is excluded but diseased plants, have as yet, not been harro

The Origin of Nove.-In the monthly notices of The Royal Astronomical Society for June, 1912, Prof. E. E. Royal Astronomical Society for June, 1912, Prof. E. E. Barnard of Yorkso observatory has a paper on "Micrometrical Measures and Focal Pecultarities of Nova Lauertes (Espin)." In the course of his paper, Prof. Barnard objects to the theory that the outburst of a nova is due to a star colliding with a nebula. He points out that photography does not show that the nove are in nebulous regions except in the case of Nova Andromede and "even here the spectroscope throws doubt on the nebulosity." Prof. Barnard believes that doubt on the nebulosity. Prof. Barnard believes that we are probably dealing with real motion caused by some force not yet known. "Indeed," he assures us, "I think this, like some of the ahnormal phenomena of the comets reveals to us the effects of new forces (call them that if you like) as yet unknown to us, but which we must take into consideration, as our knowledge of the unknown deares." of the universe advance

A Catalogue of More Than 100,000 Stars.—At the Harvard College Observatory the most extensive astronomical labor ever undertaken is now in progress. Up to the present time, the largest and most complete star catalogue in existence has been the Draper Catalogue, which indexes about 10,000 stars, with careful details concerning their spectra. This catalogue was compiled by Mrs. Williamina Paton Fleming at Harvard before 11. Since that year, the moreasing size of telescope ements in stellar photography have so greatly increased the number of stars shown upon the graphic plates that an entirely new edition of the Draper Catalogue, enlarged, and giving the record of each star to recent years seemed imperative. Prof. Edward C. Cassague, emarged, and giving for record of can star to recent years seemed imperative. Prof. Edward C. Pickering, Director of the Harvard Observatory, has contemplated such an edition for many months, and in October, 1911, the work was begun. Since Mrs. Flem-ing's death in May, 1911, Miss Annie J. Cannon has been appointed Curat nted Curator of the Astronomical Photographs, ding Mrs. Fleming, and Miss Cannon is in charge of the estatogue work. She is directing its progress so ably that what several distinguished astronomers feared they might not live to see accomplished, will probably be they might not live to see accomplished, will probably be completed within five years. She has organized the research into divisions and soctions, each of which is conducted by one or other of her women assistants. A vast collection of stellar photographs, giving a complete research of the heavess during many years, is available at Harward through the eco-persition of its Cambridge and Arequips stations, so that abounding material is fur-method for the estalogues. The work represents an infinite series of mathematical calculations, preliminary card-cial productions, the present of the present of the con-celeration of the present of the present of the pre-sentation of the present of the present of the present of the calculations. serse or manoemancal caccutations, preimmary card-cataloguing, notations, charting, etc., which depends upon the utenost care in studying and comparing photo-graphic plates, identifying stars, and determining their degrees of heightness, qualities and classes of spectrum. For such wink women, any Prof. Pickering, have proved r especial adaptability. About 5,000 stars so

#### Aeronautica

Aerial Fleet for the Argentine Navy .-- The Sociedad Agentia Argentina has made an offer to the Ministry of War, Gen. Gregorio Velez, of an aerial fiset, to be sub-scribed for by the public, for which purpose 1,500,000 illustrated post cards will be issued.

The Utility of Airships in the Treatment of Tuberculosis.—Dr. Flemming, a prominent medical authority, at a meeting of the Berlin Aeronautical Association, lectured on the beneficial effects of high altitudes on tuberculosis. He pointed out that 15 minutes' exposure to the sun's rays during an airship flight at high altitude meant certain death to the tuberculosis bacilli.

Recording Births in Aeropiane.—That the regulations and rules governing serial travel will be modeled closely upon those in use on the sea is shown in the latest set proposed by the international committee. It provides among other things, that a death or birth occurring on an aeroplane or dirigible balloon in transit, must be reported by the pilot at the first landing place.

A French Hydro-aeroplane Contest.-The Automobile Club of France has organized a concourse of hydro-acroplanes on the coast of Brittany and around the island This will be one of the most interesting events e year in the way of sport and also from a standpoint. It has received the patronage of the Minster of the Marine who is to send a fleet of torpedo boats to accompany the flights as well as two battleships which to accompany the lights as were as two outcreasings mind will be stationed in the bay of St. Malo. The British Admirality is expected to co-operate in the movement. The Automobile Club awards \$10,000 in prizes, and another prize is awarded by the island of Jersey for a race from St. Malo to the island and back.

The Michelin Cup.—This year the annual aeroplane race for the Michelin Cup representing a prize of \$4,000 race for the Minneum cup representing a price of errors, is to be a combined speed and touring event. On a given day the pilot is to cover three separate circuits laid out in the region of Paris, with the Buc grounds as a starting The first circuit is Buc, Rheims, Amiens, Roue and return, and the total distance for the three circuits is and return, and the total distance for the three circuits is 750 miles. Gasoline can only be taken on at the starting point, and the minimum speed is 36 miles an hour, but in fact it will take a speed of 75 miles as hour to succeed in the content. This means an 11 hours' flight with the needed atops, so that the daylight period of 15 or 16 hours will be nearly approached. At all events the flights are likely to bring out some high speeds.

French Hydro-aeropiane Experiments.—During the recent maneuvers of the French fleet in the Mediteranean, the war vessel "Foundre" was fitted out so as to carry hydro-aeropianes on board This is easier to carry out than in the case of ordinary acroplanes, as there is now no launching platform needed to start up the flyers. On the vessel, an overhead crane takes up the flyers as they leave the hangar and drops them overboard into the water The first Nieuport monoplane of this kind piloted by Ensign Delage showed quite a success. It is of the 3-place type and carries a 100 horse-power Gnome motor. On one occasion the aeroplane was let overboard even On one occasion the aeroplane was let overboard even during rough water, and it made a number of flights above the assembled fleet. One part of the fleet repre-ented the enemy in the maneuvers and the aeroplane could observe its position and bring back a very correct report. Some of the flights with one passenger on board lasted for 3 hours at a time, flying above Toulon and the harboar and show the next. Advantable the Lements. harbor and along the coast. Admiral Boué de Lapeyrére and his etat-major were much impressed with the performance of the hydro-seroplanes on this occasion.

Aviators' Sickness.—Aside from the mountain sickness, due to the rarefaction of the air and the muscular work done by climbers, and also the balloon disease with analogous symptoms but which does not appear except at very high altitudes, we now have to take account of aeroplane or aviators' sickness, whose effects have alaeroplane or aviators sickness, whose effects have air-ready been spoken about. These are due to the rapidity with which the maximum hughli is reached and the still greater speed at the descent, that is, the passage from a low-air pressure to a higher one. M. Berget, a French now-air pressure or a ingure our. Deeper, a reason seconant, after speaking of the conditions of the atmos-phere in general, also brings out some points on this ques-tion. Aeroplanes sometimes reach altitudes of 10,000 feet in an bour, and here the effects on the car such as humming or cracking noise are about the same as in a balloon, but the effect on the respiratory organs is different. The pilot is sooner out of breath and he feels a special kind of uncasmess. During the descent, the sart heats are of greater amplitude, but without acceler-ing. A quick descent in a sailing flight at a speed of 1,000 or 1,200 feet a minute or even more, since Morane descended at Havre from 8,000 feet height in 6 minutes, causes a feeling of a special kind, or uneasmess, accompanied with humming in the ears. Burning in the face is also felt and a severe headache, also the great tendency and rett and a severe headaone, also the great tendency to sleep which has been before observed. The move-ments of the body are sluggish and unskilful. These symptoms continue for some time after the landing, and the tension in the arteries is noticed to be higher than the

## The Junkers Oil Engine

A New Type of Motor on the Diesel Principle

By Joseph B. Baker

PROF B. JUNKERS, of Aachen, Germany, has decioned a remarkable internal combustion engine utilizing the combustion (not exploiden) of cheep, lowgrade liquid fucls by the compression-ignition method of the Diesel engine, but with certain radical improvements in design which give increased efficiency and admiration to all power purposes.

adaptation to all power purposes

Jant as Walts the father of the steam engine in its
manifold forms, so in our own day 1rr, Diesel is recogulard as the first worker in the field of the lateral
combation entire burning cheap fuel. Now comes the
Junkers centine as a radical improvement in this field.
Existing engines utilizing cheap fuel olds to generate
power at economies unnatatanable in the best companies
of the companies o

This need is now filled in the Junkers of engine (Fig. 9), in which the combisation of the free charge in a single cylinder arges two pictons in opposite directions. The cylinder is a simple tuke, open to the atmosphere at both embs—no cylinder heads, no staffing-boxe, no valves with mechanism. The greatly superior heat efficiency, high aggregate picton speculos with low spaced or each separate plotton better enversing and cooling and lower cooling losses, and the absence of valves camble this engine to show a marked reduction of weight per horse-power—down to less than one half, in some cases one quarter—and a decided horreone in efficiency when underloaded and in overload capacity. The design allows higher speeds and also a greater range of control of speed. Actual cogines in one helide the propelling capitament for twelve occunionity research in the propelling capitament for twelve occunionity endeather than the construction. The aspect of 125 kilometers per hour, and weighing less than a steam locomotive, is under construction. The field open to this type of prime mover is indicated by the fact that it consumes any cheapiliquid free, even including applatum crobe others.

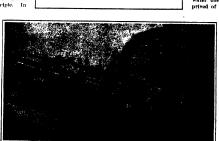
Without dwelling on technical details, the fundamental principle of operation of the Junkers oil engine may be understood by an inspection of the annexed schematic diagrams (Figs. 1 to 5) of a single cylinder engine—cylinder and patt of plotons, and the connecting rods and cranks of the engine in five successive positions throughout one resolution—in conjunction with the indicator card (Fig. 6).

with the indicator card (Fig. 6).

The arrangement of parts in the five diagrams is clear on first inspection in all but one feature. The ordrom features are the open cylinder without cylinder heads, the two pictons moving alternately outward, the control of the control of the control of the condition of the control of the control of the condition of the control of the control of the contribut hand plotted in the control of the crushs and the right hand plotted in the control of the control of the right hand plotted in the control of the control of the control of these crushs. 180 degrees from the middle crash, and the movement of the pictons, successively outward and howard, thus turning the main shaft. The object of the posts M and V will be understood as the operation of the eight is traced through one complete revolution.

The engine works on the two cycle principle, ig 1 the pistons are at the inner dead center, and the combustion space between them is filled with highly highly heated air as the result of the pre In this posivious compression stroke tion the old fuel is injected in a finely dispersed condition, igniting and burning under constant pressure during the first part of the outstroke (from 1 to B on the Indicator card, Fig. 6). With the sup ply of fuel cut off at B, the working stroke continues with expansion of the products of combustion from B to C, bringing the pistons to the position of Fig. 2. At this oint piston I is just about to open th ring of exhaust ports M. As the outward motion of the pistons continues (C to D on the card) the spent gases escape at about atmospheric pressure, and the posi-tion of Fig. 3 is reached, in which the exhaust ports are opening wider and piston H is just about to open a ring of air-ports

Figs. 1 to 5.—(Reading from top to bottom) diagrams showing operation of single-cylinder Junkers engine. Fig. 7.—Elementary plan of to der horizontal tandem engine n engine showing connecting-rod system for the two inne operating on the side cranks. Fig. 8.—Elementary side elevation of two-cylinder engine showing connect-



ing-rod system for the two outer pistons operating on the center crank.

Fig. 9. -- An early form of the single-cylinder Junker oil engine.

N, allowing fresh air to enter and to secting the cylinder. These conditions are maintained settled in plation, having passed the outer dead center (Fig. 4) begin to come back on the return stroke. In Fig. 5 the inward movement of the plations has closed both risage of the ports and the compression stroke begins on a cylinder full of cool, fresh air. The compression, F to A on the card, heats the confined air to such a temperature that the fucl, injected shortly before the plant A is reached, lightless as it is sprayed into the cylinder.

is reached, ignites as it is apprayed into the cylinder. The above is the complete cycle traced for a single cylinder cugine of one pair of pistons. In the two-cylinder (four-piston) form, which may be built as a vertical or horizontal tandems engine with great damplicity of design, the two inner pistons move together and are linked to a single crosshead connected by a pair of rods to the two outside cranks, as shown in Fig. 7, which is a plan of the engine; the two outer pistons, which also move together, being linked by crossheads and rods to the middle crank at 180 degrees, as shown in Fig. 8, a side elevation. This construction, with two pair of connecting rods, in the horizontal and vertical planes, respectively, makes every stroke of the entities a world as a commercian stroke.

vor pair of connecting from the electronic process of the engine in working as well as a compression stroke. It will be noted that the servengine is chosen to the latter of the engine in working as well as a compression stroke. It will be noted that the servengine is chosen, the content of the process of the engine of the engine is chosen, and the engine is the content of the engine is considered without servengine and for the fine spray is supplied by auxiliative driven from the connectine and linkage, which is extremely simple. The cylinders are simple ensitings, and one side of each piston is always exposed to the atmosphere and course to rest every outward stroke in a well-cooled region of the cylinder not touched by the products of combustion. This secures perfect cooling and lubrication. Plustly, owing to the division of the total stroke between two pistons in each cylinder, a high piston speed is attained with low individual piston speeds, and a long cylinder of small diameter, most favorably adapted to thorough searcenging and to perfect combustion, may be used.

#### The Government Hunta Rata

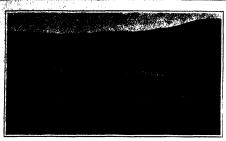
THE United States Government is conducting a business of the control of the conducting and promote spuries, which so far has cost it considerable money for every animal added to the kill. The expectation is in charge of the Public Health and Marine Hospital Service, which has spent \$1,000,000 on the killing, and is continuing the expenditure to-day at the rate of \$14,000 a month.

This and ground squirrois were picked out for the Government's game for the reason that they are held responsible for transmitting the bubonic piague which broke out on the Pacific coast in 1907, and so effectively has the hunting been carried on that not since 1909 has a single human being in that section of the country been affected with the disease.

In connection with its work of extermination, the Martine Hospital Service has conducted exteriments in the field which tend to show that rats can live an indefinite time without water. Three of the animals were put on a diet consisting of bread, meat, and cheese, but no water, and all were alleve and well only affect the experiment was begun. On the fifteenth day one was given an opportunity to drink, but made no attempt to do so. When kept without food, but with water one rat lived three days; and of six rats deprived both food and water, all died within periods ranging from two to free days.

#### "Night Wells"

A CURIOUR form of water-hole is found, and the deserts of western Australia, dry by day, but yielding an abundant supply of water by pigot, the pigot of water is preceded by weird bisdings and sounds of producing at. The phenomena discussed by Dr. Malcolm Maclares, in the cused by Dr. Malcolm Maclares, in the foological Magazine, who has, however, personally located and examined only one of these wells. He found that the water supply occurred in a loss narrow transh, at the bottom of which was a likin plate of gnelss, separated by a cuttil from the heat of the day course this plate to expand in the foot of a depressation, into which the water retreats. When it codes and centrates and centrates that it forces due to the and then water back into the transfe.





Celilo falls. Completed section of canal in foreground.

The head of the Celilo canal.

#### The Ceiilo Canal By W. H. Ballou

O PENING of the Columbia River to avaigation from its mouth to British Columbia is a project that has been taken up energetically and may be realized withto a very few years. Steamers now bring freight to Portland from Lewiston, on the Sanke River, one of the Columbia's chief tributaries, but an impeasable barrier is presented at Celilo Palls and the nearby, rapids, where reshipment of freight is necessary.

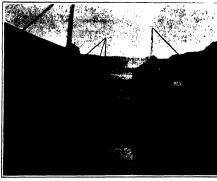
The most important work in opening the Columbia River to traffic is now going forward at Cellio, where a canal, on the Oregon shore of the Columbia River, 8½ miles long, with 5 locks, is being built. Two of the locks will be placed at the lower and of the canal, the total lift at this point being 70 feet. Another lock at the head of Five Mile Rapids will have a Hit of 11 feet. A lock at Tem Mile Rapids, which will be used at certain stages of water only, has a lift of 5 feet, while the fifth lock, at the upper end of the canal, with a maximum lift of 9 feet, will set he fifth lock, at the upper end of the canal.

be required at certain stages of the river
The project now under way was authorized by Congrees by an act approved in 1905. The cost of the work
will be almost \$5,000,000. The work involves the excavation of 1,000,000 cubic yards of rock 750,000 cubic
yards of sand, 700,000 cubic yards of cearth, the construction of 200,000 cubic yards of coucrete and 5,000 cubic yards of rouble
retes and 5,000 cubic yards of rubble

crete and 5,000 cubic yards of rubble masonry.

The Rivers and Harbors Act of June, 1910, appropriated \$600,000 for continuing construction on the canal with a view to completing it in 6 years. The new work includes the excavation of about 5% miles and, in addition, the placing of a co crete lining in sections excavated under former contracts, as well as the designing and justaliation of lock gates and mahinery, Maj. Jay J. Morrow, Corps Engineers, U. S. A., in charge of the first land district, decided, at the tim the last appropriation, that it would be advantageous to supervise the work di-rectly rather than let contracts, as had been done previously. This plan was ap-proved by the Chief of Engineers, U. S. A., and First Lieut Henry H. Roberts, Corps of Engineers, U. S. A., was at once placed in local charge of the entire project, involving the completion of con-tracts already in effect, and the completion of work by hired labor. The organization of affairs required some little time, but construction work was gotten under was in October, 1910, and it has proceeded steadily ever since.

In prosecuting the work, exercial tests have been conducted by the officers in clarge, to determine the qualities making for the best results, and materials have been placed in the work strictly on their merits. An odd feature is the maintanence of a sand-crusher plant, whereby stone rejected from the rock crushers, which crush rocks for concrete, are reduced to sand. This is somewhat singular from the fact that there are sand dames nearby where this material could be secured; but it is found that by manufacturing it, it cought is not only reduced.



Rock excavation for the tandem locks.

but the tests show it to give a greater tensile strength to concrete than any natural sand available for the work.

The Columbia River Vailey is one vast granary, and in autumn great piles of wheat sacks are placed at rail

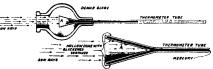


Fig. 1.—Diagrammatic illustration of the method of absorbing the sun's rays, so caught by the sides of the blackened hollow cone A that they cannot be reflected and lost. The lower sketch is an enlarged view of the cone or funnel.

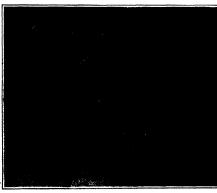


Fig. 2.—The actinometer in position to receive the curect rays of the sun.

road stations and rive building awaiting shipment to the Portland market Great economies in transportation will be effected if this great tomage of wheat can be placed on board steamers and floated down stream all the way to Portland. This is ideal transportation, effected at the least possible cost. At present a portage railroad at Cellio transports freight, both up and down the river, past the places in the stream impossible of markingtion. This additional hauling of freight is expensive and causes delay.

The canal work is expected to be an ished not later than 1916, and when this is accomplished the wheat, has, fruit, and much of the livestock, which comprise the chief staple products of the Inland Emplre, will find an ideal outlet to Portland, and thence by water or by rail to the markets of the world

#### Instrumental Observation of the Sun's Heat

#### By the Paris Correspondent of the Scientific American

THE instrument which is being used by Dr J Dupuigne in France for ob-

serving the heat of the sun presents several interesting features, one of these being a thermometer made with a hollow conteal bail. The aim is to have the suns rays fall upon a cell or absorbing chamber so that the effect of the rays will be thus concentrated. An ordinary thermometer, even though

blackened, will always reflect a good part of the rays, and these will be lost. Dr Dupaigne had the idea of making a combined cell and therms Instead of using a solid bulb, he makes a double-walled one in such a way that the mercury is spread around in a thin layer just as it would appear if put between a double funnel, and the stem of the funnel extends as a tube so as to form the thermometer When the sun's rays fall into this conical-shaped cavity (A In the diagram, Fig 1), which is blackened so as to absorb them, they are not re-flected again, as they are caught by the sides of the narrow funnel, which has a 30 degree angle. This principle is due to M Féry, but Dupnigne here applies it to a thermometer for the first time. This is placed inside a Dewar double-walled and silvered globe so that the bulb cavity is turned toward the sun's rays and the long stem of the thermometer extends to the rear The globe acts so as to prevent loss of heat. In this way the user is able to estimate the heat of the sun under the best conditions. It is the quantity of heat and not the temperature which is measured, and such an instrument is a speciform of calorimeter, here shown in Fig. 2 and named actinometer.

#### Night Letters in Italy

NIGHT better service similar to that Awhich has become so popular in the inited States and Great Britain has just been adopted by the telegraph system of taly to state institution. According to a law recently passed this service is, for the present applicable to a list of designated places. A uniform charge has been adopted of 2 centerbul datont 80,0004 a word, with a minimum charge of 90 centend (80,1106).

#### Burning Up Bad Roads to Make Good Ones By C. H. Claudy

G (001) roads present many different problems in different localities, according to the building ma-terial at hand and the character of the soil. Perhaps terial at hand and the character of the soil. Perhaps no more difficult conditions for the making of good

roads exist than in the lowlands of the Mississippi Valley, where centuries of swamps and tons of decayed vegetable matter have incorporated in the "gumbo' or "buckshot" clays of that region a plas ticity and mud-making ability which produce the worst "roads" in the world.

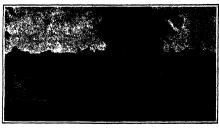
During certain seasons of the year, these so-called "roads" are absolutely impassible, vehicles sinking to the hubs and horses getting so mired that they must either be shot or dragged out with rotes often with broken legs to pay for their drivers' temerity

make a good road out of this "gr bo" is a problem, the importation of sand for a sand-clay mixture is too expensive, and there is not enough rock in the localities to make a hitching stone. alone a macadam road. But a solution of the problem has been found in the burned clay" road, in which the "gumbo"

is so changed in character by firing as to pre fairly hard and mudless surface, even after a heavy

The "gumbo" clay is black from the large percentage of organic matter it contains, and from the same reason to peculiarly sticky and plastic. But after hav-ing been baked, it forms a clinker, which, while not reck-like in its hardness, shows no tendency to form mud when mixed with water. This surprising fact is made use of by the farmers living in the "gumbo" regions, to make the "burned clay" road. Luckily the districts of "gumbo" are heavily wooded, and fuel is cheap and does not need to be hauled. The process of making a "burned clay" road is as simple as it is novel. The width of the road is determined, and it To make the loose mass into a road, nothing is needed but grading with plow or soraper to make a high crown in the center and a final compacting by rolling.

The result is a hard surface road which refuses to get muddy, which wears well, costs next to nothing to reput; and which provides a safe bridge through "gumbo" country. On either side of the reads all



Burned clay properly spread ready for leveling by rolling

winter long, no carriage could roll-on top of the six to eight tuches dressing of burned gumbo clinker, heavy wagons travel without difficulty.

The cost of such a road varies between \$1,000 and \$1,500 a mile, a very small price to pay for a good road, and particularly in a district where, until the coming of "burned clay." transportation except by railway was, in the winter time, an absolute impossibility.

#### Salving the Steamer "Jose"

THE fruit steamer, "Jose," lay at her dock in the East River, New York, taking on a cargo of case oll and gusoilne for Central American ports serious fire broke out. The vessel was towed out into vessel would have to be existed at least see the if could be towed to a position stope favorable wrecking operations. The "Jose" by right in it of shipping, and at a point where the idless is strong that work was actually him slack water at high and low tides. The task of raising the stee

or mining the stemmings was importantly by the Merritt h Chapman Derick and Wrecking Company, and the method they employed is pictured in our front page illustration. While the method is not a we believe that our s would be interested in learning just how such work is done.

The wrecking outfit con us, three on each side of the su persons, and two barges, the latter fur-hishing the steam for the pumps on the pontoons. The pontoons were provided with chain wells of the form shown, partly broken away in one of the detail The wells were of flat triangular form, flaring out at the bottom, which was open to the water, so as to allow for the sweep of the chain. There such wells to each pontoon, and the chains passed from the pontoons on one side of the vessel under the hull and to the

pontoons on the other side. Beside each chain well, there was a most which was provided with fall and tackle by which the stack of the chain was taken up. The chains as they emerged from the wells nessed through planks fulcrumed at one end. and arranged to be lifted by hydraulic jacks at the other The chains, after being drawn up tant by the tackle, were fastened to the planks by means of teggles, or U-shaped pins, fitted under the chain links, and then hydraulic tacks were operated to secure a uniform

As the pull of the wreck on the chains would tend to cause the barges to come together, they were kept at the proper distance apart by means of beams known as "spreaders." There were also top timbers that ran across the wreck from pontoon to pontoon, and were



Showing the method of preparing the road for burning. All ready for firing.



is ditched on either side. Next the surface is plowed no as deeply as no estide, and even four mules make a hard job of dragging one plow through the sticky The plowed up clay is then thrown into furrows across the road, making ridges about four feet apart. Cord wood is hald closely across the tops of these ridges, making a wooden floor above the clay, the furrows and ridges forming flues. Fire wood is piled irregularly on this wooden floor, with masses of clay filling in the open spaces. A second course of cord wood is laid on top of this mixture of wood and

lumps of clay, and all openings filled with kindling and light wood The whole is then covered with a clay blanket-usually taken from the ditches on either side to a depth of a foot, and tamped and rounded off so that the heat may remain in the mass as long as possible. Where coal slack is available, it is often substituted for wood. The point is to get heat regardless of what fuel is used.

When completed, the flues are fired so

that they will get the draft down wind The workmen pay careful attention to the burning, and when any part of the fire stack up, reinforce that flue with light kindling, so that an even burning is unstatained throughout the mass

When the wood is all burned-the organic matter in the clay aiding the bustion and in giving off heat-and the mass sufficiently cool, it is found that all the clay on the first floor, all the clay on top, and even the ridges of clay between the furrows, as well as underneath the lowest fire, has been thoroughly clinks

the stream to prevent the fire from spreading to the dock and other shipping. The fireboats pumped such a deluge of water into the vessel that it sank off shore in thirty-eight feet of water. This happened on the 13th of March of this year, and it was not until the last of July that the work of raising the vessel, pumping it out, and delivering it to the owners could be comple wreck could not have been sunk in a more unfavorable position. The bottom on which it lay was covered with boulders which, at that point, formed a pocket about eight feet deep. This meant that the



A burned clay road, two years old, photographed just after a land rate.

ed to the pontoons by means of chains that name around their bulls, as she clearly in one of the detail These served to keep the pontoons on an

Had the bose" rested on a soft bottom it would have been a simple matter to pass the chains under it. They could have been lowered under the bow and then worked back and forth until they reached the desired position. But as the wreck rested on boulders, such a course was impossible. It was necessary to get the chains under at fixed points corresponding to the post-

tion of the chain wells on the ponto and this necessitated in many cases the blasting of a channel under the wreck, through which a small chain could at first heavier chain through. The divers could not work at the bottom when the tide was running, as it was strong enough to sween them off their feet. In the short intervals ck water, but little could be a plished, and so the work dragged on through several mouths. There were a per of delays, due to snapping of the chains when the postcous were recked As the wreck lay in the path of navigation there was much apprehen-don whenever any large vessel passed by. However, the regular sound steamers very considerately reduced their speed when passing the wreck so as to prevent any socidents. The chalus were also y necidents. The chains were unable by contact with the besiding as in vessel was moved over them.

Although the task of passing the whelms (Continued in page 26).

### Correspondence

ar or early

The obliger are not reaganable for statements made in the correspondence column. Anapymous communica-tions cannot be orisidered, but the names of correspondents will be withheld when so desired.

#### A Suggestion for Typewriter Makers

To the ilditor of the Scherrica Areancan:

I would like to suggest that the manufacturers of typewriters adopt a keyboard that would be best adapted for
the touch method of operating and all of them manu-

rescure the same.

This wantld standardize the typewriter like musical instruments, most notably the piano and would be of only values or to people in obvious ways.

B. T. Bakera.

#### The First Parachute Drop from an Aeroplane To the Editor of the SURNTIFIC AMERICAN:

To the Editor of the Sunsverse Assacan:
We beg to eail your attaination to an error in your issue of July 6th, on page three, under heading of Argentanics, 'in which you take that the first parachutes drop from a fixing machine was made by Law. Per your information we would like to state that the first successful drop from an aeroplane was made by Bort Berry in a Benotis thipsue, driven by Touy Janua, at Jufferson Barracks, Mo., February 26th, 1912. You can find an account of this in any of the New York papers the day following, as this attracted universal attaction, and was taken up by many of the foreign papers, the London Graphic carrying photographs on the complete front page. We are inclosing herewith a description of this takengfrom Aero of March 9th. THE RESOURT AIRCRAFT COMPANY.

#### Determination or Free Will?

To the Editor of the Scientific American. In the issue of August 17th, 1912 a Mr. Paul R. Birge s this rather startling, positive and dogmatic state "From the deterministic, the only cientific standpoint, there is no line separating resp scientific standpoint, there is no line separating responsible wickedness from acts against the public peace which have their origins in perventities, etc."

He here out-Haeckels Haeckel in making a statement which, to the hasty reader, would pass for a scientific

wines, to the naty reader, would pass for a scientific truth grounded upon fact while in truth he has not proved the statement. What is science? The following is Huxley's definition (see "Value of Natural History

Hustey's definition (see "Value of Natural History Sciences," Lag Surmons, page 73): "Setence is nothing but trained and organized common sense."

Prof. Haescha kays in brief on page 5 of "The Riddle of the Universe;" "All purely seinntific investigations consists of: firstly, experience; secondly, inference."

Is determination proved from experience? It is not. In fact all experience and common sense is for the freedom of the will. We make a practical application of it every day. As Doctor Johnson says, "Sir, we know our will is free and there's an end on't; all theory is against the freedom of the will; all experience for it."

will is free and there's an end on t; all theory is against the freedom of the will; all experience for it."

As determination cannot be proved from experience according to the above definitions of science, it is there-fore not a thoroughly scientific standpoint. Theories that are not grounded upon the facts of experience have no right to be called scientific, still less to be called thor-oughly scientific and the only scientific standpoint.

I wonder which is the more scientific, determinism Free Will?

C. H. K.

### Bow-on Collisions

To the Editor of the Scinwitz AMERICAN:
In your issue of August 17th, under bead of "Danger
of Bow-on Collision," your Californian correspondent
seems to have entirely overlooked the fact that the
strength of the plates which compose the hull of an ocean
steamship as compared with the total weight of the
ship are an almost negligible quantity.
He says "when the forward motion of a ship is suddealy skepped nothing whatever could hold the boilers
and engines from breaking loose and going forward
and smathing the builtheairs and probably the bottom,"
and than he pictures the horrible results from the
breakfor of the steam wines. To the Editor of the SCIENTIFIC AMERICAN:

and than he pictures the horrible results from the breaking of the steam pipes.

Now anytices with the floast, amount of practical knowledge of the strength of material knows that such conditions are impossible.

A big steamship, as a whole, samen be instantly strength beauses the force of any blow that may strike size the strength of the half will be taken up by the successive crumpling of the plates, so that in a very large this passed, any jay would be felt in the middle of the skin, which is a strength way jay would be felt in the middle of the skin, which, and the plates, so that in a very large this passed, and the plates of the skin in the strength way in the skin in the strength way in the skin in the middle of the skin, which is the skin which this is seen as the skin of the skin in the ski

A CONTRACTOR OF THE STATE OF TH

space for any paper to publish so absurd a theory.
Gloucester, Mass. REUBEN BROOKS.

#### The "Akron" Accident To the Editor of the SCIENTIFIC AMERICAN:

We have noticed with interest the various reports which have appeared in the Scientific American, as an attempt to explain the explosion of the durigible balloon, "Akron," at Atlantic City, on July 2nd. We find it necessary to correct a few points on which you have apparently been misinformed. It is true, to a certain extent, the "Akron" showed no speed lines. It was not built for them. It was built according to the specifications which we received, and corresponds exactly to them.

The rudder was not small, although perhaps not quite rly balanced, and required too many turns of the

wheel to move it.

The "Akron" was equipped with aeroplane surface about sufficient size to give a reaction of about 1,000 pounds either up or down. Such a reaction would be sufficient. There was only one pair of orientable propellers, driven by the central power plant. There were U-tube pressure gages from all the ballonets and from the gas compartment.

The hydrogen used was exceedingly pure, and tests showed that the fabric had suffered practically no deteriration from this or any other cause.

You may be interested to know our views in the mati

There was no representative of the Goodyear Tire & Rubber Company in Atlantic City to witness the accident, and, consequently, we must be our conclusions on the various and some times conflicting reports of those who were eye witnesses, and upon the investigations which we have made as thoroughly as possible of the mnants of the wreck.

The wreckage was raised from the water at consider-ble expense, and its condition carefully noted Sample able expense, and its condition carefully noted Sample pieces of fabric were tested out, and all possible tests could in any way throw any light on the cause of the accident, and probable reason for it.

We regret that our statement, from the very nature of things, cannot be as explicit and satisfactory as we would like to have it. However, we will give it to you for what it is worth, and from it you can draw your own conclu-We have made it out in the form of a general dissions. We have made it out in the local of a general dis-cussion of all the theories of the possible cause of the acc-dent. It is hard to tell which one is the most plausible. In thinking of the dirigible balloon "Akron," kindly

remember that the gas bag only was constructed by the Goodyear Tire & Rubber Company, and that, according to the general specifications and suggestions of Mr. Vaniman. The car and the entire work of assembling was carried on at Atlantic City under the direct super-vision and direction of Mr Vaniman. We believe strongly in the future of the drigible, considering it only atter of time before its development in this country will equal and surpass its development in Europe and other foreign countries. We believe that this accident contributed a great deal to the science of the manufac-

re and operation of the dirigible balloons.

We are ready to construct dirigibles of any type, and will welcome anything that you can do to assist in bring-ing the dirigible to its successful completion in this coun-

Any and all of this letter is for publication if you so desire, for we are willing and in fact wish everybody to know the true facts of the case. We are glad to furnish any and all information which we can, which will in any way throw any light on this unfortunate accident, and

Unfortunately a complete examination of the gas bag Unfortunately a complete examination of time gas way was impossible, as a large part of it had been out up and carried away as souvenirs, before it could be protected. Our complete report is as follows:

A large number of witnoses were investigated, whose accounts wary greatly as to detail, but the following sum-

ry covers the points on which rehable eye witnesses se and which we have determined from our investiga-

slicon started directly away from the hangar, and holding its course, proceeded to a point over Brigantine Beach, then made two wide circles, and was making the third when the accident occurred. The ship was rising third when the accident occurred. initing the whole time that it was in the air, and had at-ained an elevation of about 2,500 feet.

Shorily before the bag collapsed the bow of the ship

shortly before the bag collapsed the bow of the ship seemed to be pointed downward and the orientable pro-pellers ranning, appearuity in an effort to bring the ship down to a fewer level. Accounts vary as to the exact method of collapse of the bag but the general opinion is, that the runt in the bag courterd near the stern; the ship was almost on an even keel, and poised a moment in that was amonit on an even teel, and poised a moment in that position, then the store such and she plunged downward; when pair way down the greater portion of the bag tore lesse fresp size our; the our shot downward storn first in a nearly worklash position until almost down to the water, when it swang around, purtially righting itself, then exhibited the first in nearly its normal position. The por-tion of the gas beg which had been torn loose, dropped into the water a short distance from the wreck, and fineted up the channel with the tide.

There have been several theories advanced as to the cause of the accident

(1) Fire or explosions -There was no evidence confirming this theory, the tanks, while battered up and more or less broken to pieces, showed no signs of having een ripped open by an internal explosion All the me tors were recovered but the small one and the cylinders found to be intact. Some of the bodies were burned, but the doctor who examined Calvin Vaniman stated that these burns were probably made by hot liquid of some kind (presumably hot water from the radiators) and not

by hot iron, burning gasoline, or by flame A violent explosion of gas would have been impossible Recent tests of the gas showed it to be over 80 per cent pure hydrogen, although the balloon had been inflated mearly four months. There was no signs of fire discovered on any part of the balloon except one small spot on the fabric, which had evidently come in contact with a hot pipe. A few reports of smoke and flame having been seen are current, but most witnesses, particularly those familiar with the operation of gasoline engines, say that the smoke was only the exhaust from the engine, and that there was no flame.

(2) Rupture of gas bag due to internal pressure -There current as to the gas b under-strength fabric, or that it rotted from exposure, or

from impurities in the gas. The facts are these.

Mr. Vaniman specified in his design a maximum presure corresponding to 1 inch of water. The balloon was actually built to stand an ultimate pressure of 8 inches, thus giving a safety factor of 7, which considerably exceeds the usual figure. But there was reason for this excess strength. It was to be an experimental machine of rather a novel design, and the first over made in this country. Likewise, Mr. Vaniman, although a great inventor and genus in his way, had not had the lon practical experience with dirigibles which is given the European pilots, and which insures their doing the rigal thing at the right time. As to the fabric being rotted by the gas, or otherwise, it is sufficient to say that samples cut from different parts of the bag after the accident, showed no material deterioration in strength. All seams were trude reinforced and showed far over the 100 per officiency as recorded by the numerous Although, on account of the sourcent hunters it was impossible to tell where the bag had first broken, it is manifest that no seams (so far as observed) had been even

In spite of the extra strength, the balloon could very easily have been burst by letting the pressure go up to an excessive amount. It would take a faire 50 times as strong to resist all the expansion likely to occur from the sun's rays and it would be impossible to resist that due reasing altitude. There is some slight evidence which seems to point in this direction. It was morning, the sun was getting hot and the balloon was rising at the time of the accident. Only the two rear engines were running. There were scalds on Mr. Vaniman's body running There were scalds on Mr. Vaniman's be which would indicate that something had called him the roar of the car, away from the pilot's bridge where the pressure gages were located He had a large automatic safety valve of French manufacture, which should have ample to take care of just such an emergency, but we found on examination that he had provided it with extra springs since the first flight, which did not allow it to open fully. On the other hand the bottom of the bag was made purposely weaker than the top so that if it did burst it would in all probability retain enough gas to let the machine down in safety.

the machine down in safety.

(3) Breakage of the suspension ropes —This theory has not to our knowledge been advanced before, but it would well explain all the observed facts and has strong evidence to recommend it. The size rope used for supporting the car gave a nominal safety factor of only about three (3), and they had been tightened up much beyond their proper allowance We have it from two of the mechanics that these ropes had been breaking frequently when simply standing in the shed. If two or more of them happened to break at once, all the others would speedily follow suit, thus throwing all the strain on the bottom fabric, tearing it open and ripping the whole bag from the car.

Propelle breakage -This also theory. We regard it as practically impossible that a propeller could have broken from centrifugal force alone. They were of wood, run at a slow speed, and were speci-They were of wood, run at a slow speed, and were speer-ally designed for the work by a reputable French concern. If, however, any part near the one broke, a suspension rope for instance, a blade striking it, would be easily broken off and might fly into the gas bag in such a way as to cause a fatal rupture

While we deplore the fact that it was impossible to ermine the exact cause of the accident, on take satisfaction in the fact that all the accidents outlined above are entirely preventable.

In the meantine, we cannot appreciate too much the work of those who went to their death for the cause that is yet new, and which, like everything new, demands more

than its share of money and lives
THE GOODYEAR TIRE AND RUBBER COMPANY, Aeronautic Supplies Department. Akron. O.



Fig. 1. - Menhirs at Chenat.



W. E. will not commence this article with a minute study of the 4,458 dolmens and roofed alleys which the French Commission of Megalithic Monuments has recently catalogued, but we will simply, in the strength catalogued, but we will simply, in titles of prohistoric times, that are doubtlesse contemporary with the menthrs, colomnados and crombets, which we shall spend of late.

According to the definition given by Bonstetten and generally adopted by archaeologists, a defined by a mountent of stone, have a convent with earth, and of dimensions sufficient to contain several tombs. It is constructed of a variable number of rengh that stones supported in a horizontal position by a variable number of stone pillars. The number of pill lats may be only two, as in the defined known as the Merchantic Table at Locardina and the pillars and the support of the pillars may be only two, as in the department of Dordoger (Fig. 5); there, as in the Chere-Levée at Brantôme in the department of Dordoger (Fig. 5); our as in the 1 rice defined in Creme (Fig. 5), and the Routhenaux-Loups at Beaumont in Dordogne (Fig. 5), or a still larger number.

If the dolmen contains many pillars supporting several entablatures, it is called a roofed alicy

An exceedingly line specimen of this class, the Roche nux-Fées (Fairles's Rock), is still seen standing near Réters in the Department of He-Ste Vhatne

The megalithic monuments are not evenly distributed throughout France Theo are run in the cost and southeast except in the departments of the Anie and the Alpes-Marltimes, according to the statement of Joseph Déchelotte in his 'Pre-listoric Archeology' (1988) They are found most alundantly in a

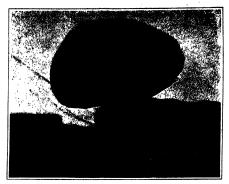


Fig. 2.—The rocking stone at Boussac.



Fig. 4.--Menhirs at Lampary.

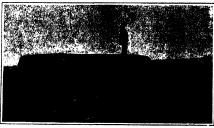


Fig. 5. -- The merchants' table at Lorenzrianuer.



Fig. 3. - The Urbe Delmes

some included between the Breton Coast of the English Channel and the Mediferranean abores of the departments of Gari and Herault. Two very compact groups may be distinguished: the southern group, including the fits departments of Ardeche. Aveyron, Gard, Lot and Lowler; and the western or Breton group, which is most densely aggregated in Finishère and Morbihan.

The attentive study of the dolmens and rorfed alleys shows that their builders placed the large entablature stones with their plane faces downward or inward, paved the floor below with smaller flat stones and, in general, filled the interstates with still smaller stones. Some of the pillers and roof stones are so bage that it seems aimost impossible that they could have been transported and assembled in the infrancy of critisation with the aid of rudimentary tools, especially as some of these stones have evidently been transported to considerable distances. For example, a stone weighing 40 tons, found at Perotte has been moved to miles and one at Moulins 22 miles.

The method employed by these prehistoric builders are entirely unknown to us: but experience has demonstrated the possibility of transjorting and erecting possibility of transjorting and erecting very heavy masses without the ald of complex machinery or even of ropes. The stone can be raised by means of a series of levers and supported by placing earth beneath 1s. After the block has been raised to a certain height it can be allowed to glide down a sloping bank of carth plastered with clay, and by repeating these operations, the stone can be transported to an indefinite distance. Poshiby the cave develors made use of ropes and of round logs, rolling on a path paved with smaller logs or planks. Whatwer method was employed, the construction of the megalithic monuments required a spirit of order and discipline.

(Continued on page 185.)

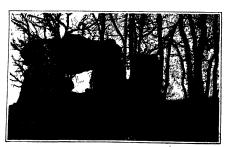


Fig. 6. - The Pierre-Levee at Brantome.

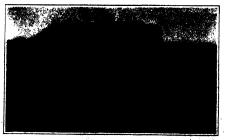
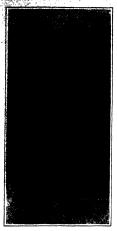
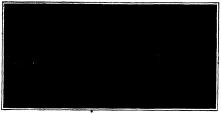


Fig. 7. -The Rocks-aux-Loups (Wolves rock) at Beaumont



The effect of acid rainwater on a calvanised water pipe of cheap Bease mer steel in service about five years



Hand-fired boilers, showing production of smoke by careless and uneco-nomic firing. Loss of efficiency is probably between 10 and 15 per cent.

# Smoke, the Destroyer By R. C. Benner, Ph.D., University of Pittsburgh

According to the smoke inspector of Chicago, the black fumes believed by the chimneys of his city cause an annual loss of fifty million dollars an ruined merchandise. Since one third of the American population lives in cities, the United States Geological Survey estimates, on the basis of this smoke inspector's figures, that the total loss caused by soot reaches a diszy south of six hundred million dollars. Here is indeed a problem for the scientist. That he has not neglected his opportunity is evidenced by the following article, which, written by the chemist in charge of the University of Pittsburgh's smoke investigation, shows exactly to what the destructive action of smoke is due.—Editor



A beamirched monument. Carved rary, showing soot discoloration.

I T may seem surprising that an architect should specially interest himself in the purification of the air, but the problems confronting him in the designing of buildings to be erected in a smoky town are so manifold as to make a clean atmosphere a matter of moment. For architecture does not depend upon a knowledge of materials alone, nor upon designs of beauty alone, but is very dependent upon the atmosphere, and when smoke pollution is taken into account one has much to contend with.

Soot possesses the properties inherent in itself for making the worst possible kind of dirt.

making the worst possible kind of dirt.

1. Finely divided carbon forms the basis of our best black paints. It is opaque and has a large coverage power, i. e., a little will make a large warface glery.

2. It contains tar, which, as well as being black and corrosive, causes the soot to stick to any material with which it comes in contact.

3. Finely divided carbon has a great absorbing power, absorbing large amounts of the sulphur acids, more especially sulphurous and sulphuric, with minor amounts of hydrogen sulphide.

No wonder that our houses look grimy and miserable and that the use of skylights in many places is made impossible, while in others it is necessary so to arrange them that they may be readily cleaned. Otherwise they would soon become useless be cause of the accumulation of soot.

Again, changes in design so as to make a different arrangement of drain pipes, etc., are, at times, necessary in order to prevent the spiashing of rainwater containing soot muon the building.

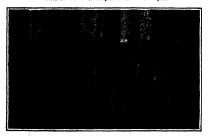
In a smoky city, too, much more glazed tile and vitrified brick is used for the out side of buildings, as it makes the cleaning a comparatively simple matter, washing alone being necessary. Building stones, such as limestone, marbles or sandstones, with calcareous binding material are rapidly disincareous binding material are rapidly disin-tegrated by the acid in the soot and the air. Therefore, materials such as granite, and-stone (with a silicious binding) brick, etc., which are not attacked by the sulphurous and sulphuric acids in the soot, should be utilized. But, unfortunitely, shart stone which is most easily affected, disintegrated by the atmospheric acid and decolorized by soot, is the one which it is easiest to work into the desired shape for building purposes. Grapite and similar stones, which are pracanattacked by acid and impervious meisture, consequently offering little ces for the most to lodge and readily self-cate in working. Thus the architect highesty in working. Thus the architect highest confronted with monetary con-

lasgow, several years ago, the subwidely discussed and various were advocated, L a.: Painting the stone with paraffine, similar to the treatment given the Obelisk in Central Park, New York, and covering with solutions of soap and alum. silicate of soda, carbonate of baryta, etc., and also patented preparations. These are all more or less effective and tend to reduce the evil effects of the acid and soot to a minimum by closing the pores of the stone. Sand blast is used for cleaning in some places, but this abrades the surface, leaving it rougher than

Hydrochloric acid is utilized for washing down ston walls, but it must be used with care, as discoloration is likely to follow. Cleaning the stone is at least but a temporary expedient and represents a periodic tax on the owner. The logical thing is to make cleaning un-necessary by water-proofing the stone and doing away with the smoke.

The sulphuric acid in the air and occluded in the soot acts on calcium carbonate (the principle con-

Lower story of Keenan Building after it had been washed down. This story is cleaned twice a year.



Painting Exchange National Bank. This old iron front, one of Pittsburgs structures, is given two coats a year.

stituent of stones most readily corroded by the acid in the soot), and forms calcium sulphate (gypsum), which is more readily soluble in water than the calcium car-bonate but, at the same time, causes the stone to undergo a physical change, making it swell and be come porous and friable and easily disintegrated, also roughening polished surfaces, thus making them more susceptible to attack by acid and moisture and also easily affected by weather

Dr Angus Smith has found mortar to contain 28.33 per cent of sulphuric acid, equivalent to 48 16 per cent Ca So, caused from the action of the sulphuric acid in the air on the calcium carbonate. Limestone and marbles have been found to contain 0.52 to 3.85 per cent Ca So, and because of the comparative ease with which this substance is soluble in water, the surface is readily croded. The effect of the sulphuric acid absorbed in soot is rather marked on most metals and greater than the action of a like amount of acid

in the rainwater or air it would seem from observations taken in Pittsburgh that soot containing acid adheres to the metal by means of its tar content and forms an electrolytic couple, thus making corresion much more rapid. In the case of iron and aluminium, the oxide (or basic sulphate) is produced, at least in part, from the sui phate, and the acid is used over and over

To experimentally verify these observations, duplicate sets of various metals were fastened to two boards. One set was protected from the soot in the air by means of beese cloth, yet still exposed to the air and he rain. The other set was left puprotected from the soot and it shows a much greater amount of corrosion

amount of corrosion

The following figures obtained by Mesors
W. B. Worthington and A. Rattray, show
the accelerating effect of the acids in the
air Quoting from Cohen, "A number of rails were placed in suitable positions by the side of the line, and weighed at intervals and the loss of weight recorded. The rails were of the ordinary railway section weighing 86 pounds per yard." The annual loss of weight from corresion was as follows

Tion thirty and who i	- 1011011		
		oss in weight No of	
	In pounds per	verts of	
	average year	observations	
1 In the center of the	ie.		
town	104	17	
2 In adjoining pla-			
in smoky tunne	1 118	13	
3 In a wet place			
same tunnel .	171	8	
4. On the seacons			
among wand bil	ls 0.18	17	
MIL			

decoration is one affected as much by the amount of smoke in the air as by the tastes of the owners of the building. Interior (Concluded on page 186.)

- 13 the 18 section to declared distributions of the Trainings of the strategic

### The Heavens in September

#### Indications of the Sun's Motion Through Space at 12 Miles per Second

By Henry Norris Russell, Ph.D.

 ${f W}$  E considered last month some of the coficiusions VV which might be drawn from a study of the mo-tions of the stars in Scorpius and Sagitarius; but we were far from exhausting this topic,

The diagram, showing the amount and direction in which each star will move in the next hundred thousand years is reprinted here, and, for comparis second is given exactly similar in nature, but exhibiting a portion of the northern heavens (now visible in the evening sk)), in which the constellations Lyra, Hercules and Corona Boreaiis may at once be recognized.

Each limstration shows all the stars in the given

region which are brighter than the fourth magnitude. with the addition of a few slightly fainter ones to mark certain familiar constellation figures

it needs only a ginner to see that there are very marked differences in the way in which the stars in these two regions of the sky are moving. In the vicinthese two regions of the say are moving. In the vicinity of Scorplus aimost all the stars are moving southward and westward (that is, downward and toward the right on our diagram). This applies not only to the stars of the moving cluster which we described last month (which are all going in the same direction and a, the same rate), but to the remaining stars, which though moving in different directions and at different though moving in interest to move downward in all but two cases out of sixteen, and a distinct, though less erwhelming tendency toward the right. In the region of Hercules the situation is quite dif-

ferent. Hardly any two stars are moving in the same direction or at the same rate, and motions to the right or to the left, up or down, occur with an entire lack of system, while four stars are moving so very slowly that even in 100 000 years they will not have changed their position by an amount great enough to show the diagram, so that they appear simply as dots with

no arrows attached to them

In the first region we have some approach to ords in the stellar motions, in the second we find chaos. It may seem at first sight surprising that it is the order, and not the chaos which demands explanation, but we must remember that the stars which seem to us to be neighbors in the sky, and to form a definite configuration have usually no real connection at all; some are many times as far away from us as others, and they only seem near together because they are nearly in line with one another from our particular point of We need not, therefore, expect to find the stars of a given constellation moving in the same direction, much less at the same rate, and, unless we can show some definite reason to the contrary, we may expect to find as many going northward as southward, and castward as westward

This is just what actually happens in the region of ercules, and we may, therefore, rest content to ascribe what we observe there to

Something more than chance however. termines the apparent rate of the star proper motion. Of two stars, each of which is really moving (at right angles to our line of sight), at the same number of miles per second, the nearer one will seem to move the faster, in direct proportion to its neurness It is therefore likely that the stars which have the large est proper, motions are the nearest to our system. But this is by no means an infallible test, for a star whose actual motion in miles per second, is very imple, will seem to move fast, even if at a con-siderable distance. In spite of such exceptions, it is undoubtedly safe to assume that the stars whose apparent motion is that the sains whose apparent motion is rapid arc, on the average, much nearer than those which seem to move slowly. These principles are well illustrated by

the four fastest moving stars shown on the Hercules diagram. They have not been repeatedly observed for parallax, and the results show that they are all relatively near our system

Zeta Herculis (shown in the unser right-hand part of the figure) is the near est, its distance being about 23 light-years Next come  $\mu$  Hercules and Vega (the two inpidly moving stars in the left-hand half of the dingram), whose distances are 31 and 35 light-years, according to the latest observations. The star of largest proper motion of all in the region, \( \gamma \) Serpentis,



Proper motions of stars in Hercules, Corons and Lyra in one hundred thousand years.



gittarius in one hundred thousand years.

appears to be farther off, about 60 light-years (according to the mean of three measures of its parallax, which do not agree as well as in most cases). Its actual rate of motion must be much more rapid than that of the other stars. But why do the stars in Sagittarius behave so different? It may still be true that those which seem to move fast are, on the average, nearer to us than the others; but this does not explain the general southerly drift of all the stars in the region. If this peculiarity was c stellation we might be content to say that the stars in this particular part of the heavens had a secnot to quite so marked a degree, is found in his not to quite so marked a degree, is found in heat parts of the sky. There is a distant preference, among the motions of the stars for a certain quarter, and an avoidance of the opposite quarter. The favored direc-tions run by no means at random. They all point away from the region of Heronies and Lyra, and, toward that of Canta Major

Our Sun itself is the seat of the motion, and is steadily progressing through space, like the other stars, carrying all its attendant planets with it. The appar-ent drift of the beavens is the reflection, if we may so speak, of this motion of our system toward Hercules. In either of these regions the influence of the solar motion changes only our distance from the stars, with-

out influence upon their apparent motion acrosky, and we get a chaos of proper motions with no marked preferences. But when we look out nearby at right angles to the motion of our system, as is the at right angies to the motion of our system, as is the case in Nagittarius, the apparent drift is at a maxi-mum, and only those few stars which are going the same way as the Sun, but faster, appear to move oppo-site to the general run of the stars. It meed bardly be added that this hypothesis of the Sun's motion has been fully tested, and the proof clinched by spectroscopic observations. The average rate at which we are wing nearer to Hercules, and farther from Canto Major, is twelve miles per second, which must obviously be the rate of the Sun's motion in space.

The Heavens. The regions of the sky of which we have spoken are both Vlabble in the early evening, though by our hour of observation a part of the southern one has set. We may still find Nagittarius near the southwestern hostzon, and, passing northward over Ophinchus, recor , Hercules, and Lyra a little north of we the last high up toward the senith. Cygnus is still higher, practically overhead. The Great Bear is low on the northwestern and northern horison, with Draco and Ursa Miner above. Cassiopeia and Cephens are above the pole, and below the former, in the northeast, are Perseus and Auriga. Taurus is rising, and Cotus occupies the southeastern sky. Above these are Aries and Pisces, then Andromeda and Pegasus. Aquarius and Capricornus occupy a wide dull region in the south. Lower down is the bright star, Fomsiliaut, in the Southern Fish, and still lower the constellation of the Crane well visible only in more southern latitudes.

The Planets Mercury is morning star all through the month, and

is well observable about the time of his greatest elonga-tion on the 7th. when he rises only a little after 4 A. M. He is in Leo, and passes about five minutes of an hour north of the bright star Regulus on the morning of the 10th. This will be an interesting con-junction. The planet is much the brighter of the two, exceeding the star about five

Venus is evening star in Virgo, and may perhaps be seen low in the twilight in the latter part of the month, when she sets about 6:40 P. M. Mars is also an evening star, theoretically, but is too ear the Sun to be observable

Juliter is evening star, setting about 9:30 P. M. in the middle of the month. Saturn is in Taurus, and rises about

the same time that Jupiter sets.
'Ugaras is in Capricornus, and comes
to the meridian at 8:30 P. M. on the middie of September. Neptune is in Ges observable only in the morning hours.

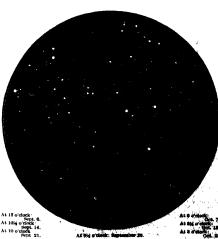
The Moon is in her last quarter at 8 A. M. on the 4th, new at 11 P. M. on the 10th, in her first quarter at 3 A. M. on the 18th, and full at 7 A. M. on the 26th. She is nearest us on the 9th, and furthest away on the 21st.

At 5 A. M. on the 28d the Sun grosses.

At 5 A. M. on the 23d the Sun crosses the equator and enters the "sign" of Libra, though not the constellation, since the precession of the equinous has car-ried the two out of agreement since classic times. But in any event, we may rith precision that this is the m

The second

the autumnal equinox. Princeton Observatory.



NIGHT SKY: SEPTEMBER AND OCTOBER

#### Swimming Machine

#### Truck for Aeroplanes.

Dillino the secent war maneuvers the aeroplanes of the aviation squad were transperred to the aviation station by a motor truck of standard make. The work of this motor truck was very satisfactory, education in the fact that it had to travel over bad roads and very rough ground. The aeroplanes, however, had to be completely dissunsited in order to-stow them on the motor truck. In European countries trucks of aprecial design have been built for the purpose so that the aeroplanes do not have to be dismantled completely, and hence can be assembled more quickly. The accompanying photograph shows a truck of this type exhibited at the Beigian automobile expedition last winter. This truck is a trailer, not being provided with a driving mechanism, but being adapted to be hauled behind a motor truck or an automobile. The truck is designed to take a monoplane from which the planes have been removed, the latter being packed alongside the body of the aeroplane.

#### The de Lesseps "Wind Wagon." By T. M. R. von Kéler.

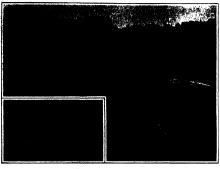
W HiLE the idea of driving motor care by means of an "acroplane" propeller is not exactly new, the invention of Counte de Lesseps, shown in the accompanying photograph, presents several exceedingly novel features. It is by all odds the most elaborate attempt on the part of a motor car designer to utilize the pushing power of a large two-bided propeller. The machine is not an ordinary automobile chansis in which the differential and transmission have been temporarily "decluthed," so to say, but it is a cut designed especialty for this sort

of propulsion.

The dis Lesseens car has no "live axio," and all its four wheels are "free turning." The propeller is deliven by a single chain leading from the main shaft to a short Jack shaft to which the blades are fasticularly the shaft to which the blades are fasticularly the shaft to which the blades are fasticularly the shaft to which the shaft to start a present and the shaft to start a propeller blades. These guards are also expected to catch the broken pieces of the propeller blades in case of an accident. The moder is of 40 home-power. In the long trial run of were 300 miles the car statused a speed of about 02 miles are shafted or ore fairly good reads—a notice able feature of the risk feets (tast pre-tically no dust was raised by its passage. This latter very described settlings extiling and the stricture of the state of settlings of the stricture of the stricture

This latter very desirable stribute or such a car is easily explained by the sissues of the sissues of the sinding "dead pan," which haugs below the chead's of the ordinary motor cut, and which deficies a strong sit curveis directly upon the road surface. Furthermore, there is the free terming of the near wheels, which in the de Lessen our perform only a stampe rolling motion, which in the surface and a strong pass or "fight perform only a strong pass or "fight perform only a strong pass or "fight perform only a strong pass or "fight perform of the strong pass or "fight perform of the strong pass or "fight" spons like proof marknow, ownsigh to the

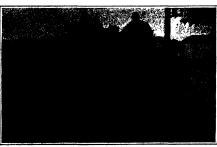
Self-cycles which would seek to over-



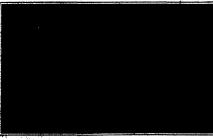
Propeller driven swimming mackine.



Truck for transporting aeroplanes.



The de Lessens car starting a trip from Paris to Lyons.



An example of "black lightning."

balance these advantages and to retard a general adoption of propeller drive are not missing. Starting the ear in a strong headwind would be almost impossible, the forward pull and speed being largely dependent upon the movement of the surrounding atmosphere, in heavy sand or sticky and it would also be difficult to obtain sufficient tractice power to overcome suction of the mud at the moment of starting. Once the cut has been set in motion it is kept going at a small expense of bower.

Then there is the great danger of steertransport of the constitute of the constitute characteristics and the car under changing that all the constitute of the gives of the action of the large propeller, which submits the mechanism to consume to sound stresses. Tests made on the lee here in America with a similar wind warm's have shown it to be incapable of taking short turns at your melerate used.

white shown in the management shows sharp turns at even moderate speed. While the de Lesseps car may be interesting from an engineering point of view, there appears little danger of its general introduction—at least in its present form.

#### Black Lightning Flashes

THE accompanying photograph of Bighting, showing both bright and black flashes, was taken at Lake Benton, Minnesota, on the night of May 2d, 1912, at midnight. The shutter was open one minute, during which time probably several successive flashes occurred.

Black flashes are frequently seen in lighting photographs, and the conditions under which they occur are now well understood. White flashes with black borders, as shown in the present case, are a characteristic feature of the phenomenon. The black flash does not occur in nature, but is a tick of the photographic plate, and different kinds of plates are sensitive in very different degrees to the process involved. The present picture was prodably taken on a film, and shows the phenomenon in a marked degree

any tracer on a marked degree we passed in a marked degree As long any as a Seb Mr. A. W. Chydrag As long any as a Seb Mr. A. W. Chydrag As a Mr. A. W. Chydrag and the Interactive of the Mr. A. W. Chydrag and the Interactive of the Mr. A. W. Chydrag and the Interactive of the Seb Mr. A. W. Chydrag and the Interactive of the Seb Mr. A. W. Chydrag and the Mr. A. W. Chydrag and the

Suppose, row, that a lightfuling faish has registered its impression on the plate, and before the shutter is closed a second fliesh occurs in the same hold. If the latter is bright enough, the clouds will be lighted up and the light reflected from them will produce the diffuse illumination of the fold necessary to produce "gs-versal" of the original image. That often only the border of a bright flash is reversed is explained by the fact that this is loss bright than the "cost" of the discharge and is more easily affected by the subsequent limitation of the field.

An attempt to explain the chemistry of this process (somewhat too technical to be given here) will be found in the Verhandlungen der deutschen Phonskalischen Gesellschaft, September 15th, 1911, p. 573

170.

In photographing lightning for selentific purposes it is destrable to select plates that are as little as possible susceptible to the Chaden effect, for, as stated above, this effect may entirely obliterate certain flashes. Tests of a large number of plates from well-known makers were made a few years ago by Dr B Walter, of Humburg, to determine which are most satisfactory in this respect. (See Janafen der Physik, 4te Folge, Band 37, p. 182.)

#### The Trade-mark as a Rusin By W. E. Woodward 16, 1919, by Muna & Co.

THE average business man has only the raguest notion of the value of a trade-. He does not realize that it is very mark. He does not reakte that it is very often the connecting link between the producer and the ultimate consumer; that it is a symbol of good will, a tangable asset with a determinable money value, that it must be chosen and applied not in a haphanard way but with a due segart for its psychological effect upon the public. Nor does he realise the importance of complying with the salutatory requirements which secure to him a promotine robit in a third water. mark.

him a property right in a trade-mark comwith the property right that

parable with the property right that an inventor acquires by taking out a patent. The following is the eighth of a series of articles, written by a man took is at once a trade-mark, an advertining, and a business expert, a man who has a first hand of the correct methods of trade-marks and of the correct methods of trade-mark exposition. The series, which will be eventually published in book form, will include discussions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elemons of a good trade-mark, and trade-mark protection.—EUTON, I n.-Epitor.l

#### Trade-mark Protection - VIII. (Continued from page 168, August 24th, 1912.)

An owner of a valid trade-mark is protected by law in its exclusive use, as he is in the use of any other property that he may own. But to obtain this protection his trade-mark must possess all the essentials of validity, and he must be able to prove infringement, in short, the burden of proof is upon the owner of the trade-mark

leged to have been infringed. Infringement of a trade-mark is defined in Hesseltine's "Law of Trade-marks and Unfair Trade" as. "An imitation such as would be likely to deceive the ordinary customer in the usual course of trade in the purchase of goods of one person as those of

The question of the infringement of a registered trade-mark is covered by sec-tions 16, 17, 18 and 19 of the Act of 1905. Section 16 is quoted here:

tions 16, 17, 18 and 19 of the Act of 1905. Section 16 is quoted here:

New 16 That the registration of a tradenart under the providence of this act shall be 
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suc verdict is rendered for the pisintiff, the court may enter judgment therein for any sum above the amount found by the verdict as the actual damages, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs

Note that in cases of infringement of a registered trade-mark, suit may be brought in a Federal Court, that triple damages may be collected in case the proof of infringement is established, and the defend-ant will be forbidden to use the offending

Infringement is a specific violation of the trade-mark statutes. It falls under the der and more general law of unfabusiness competition, which takes cognizance not only of trade-mark infringement, but also of all other devices of deception by means of which one person trades upon the reputation of another

Nims, in his excellent book on "Unfair

Numa, in his excellent book on "Unfair-lusiness Competition," says "the use of a special mark in connection with particular goods or a puriturial business is a representation that those goods or that business or the goods or business of the person to whom the mark belongs: that they belong to the person to whom the mark has become identified. If such representation is false a of trade mark therefore, is unrely a special laced branch of the broader doctrise of unfair

competition. Relief in trade-mark cases is afforded upon the express ground that every person is entitled to scare and profits as result from a reputation for superior skill, industry, or extent profits, or, in other words, from a trade-mark state of the process principle upon which relief is afterded in cases of unfair competition. The right of action is received in tade-mark cases is mased upon the provided that an oreliastic is made upon the provided that an oreliastic is made upon the provided that an oreliastic interest of the provided properties of the offect of such use or time, regardless of the offect of such use or time, regardless of the offect of such use or time, regardless of the offect of such use or time, regardless of the offect of such use or time, regardless of unfair competition pure and simple upon principles analogous to trade-cialized it as his, regardless of the offect on others. If someone else uses it or instates it, the owner claims a right of action because the unark is his and his atome."

And further on, in the same volume:
"Unfair competition does not necessarily larobre the violation of any exclusive right to use a word, mark, or grained. It may arise must be used to the state of the same and the And further on, in the same volume

This subject is so large and far-reaching that we can touch upon it here only in the most general way, and as incidental only to the question of trade-marks.

Unfair competition, so far as trade-marks are concerned, may take various forms, the most common of which are discussed in the following.

#### Plain Bare-faced Theft of Trade-marks.

In certain lines of business, notably the liquor, wine and eigar trades, this sort of induor, while and olgar trades, this sort of infringement is very common and organi-zations of houses dealing in these products have been forced to check it. Many States have enacted laws making the counter-feiting of a labor or a trade-mark a penal offense. Under the Federal law, infringement is not a penal offense, and only civil actions may be brought under this statute.

One of the most interesting cases of the adoption of a trade-name belonging to ansampson or a trace-name periognic to as-other that has appeared in the Federal courts is that of Wolf Bros. v. Hamilton Brown Shoe Company (165 Federal Rep., 413). Wolf Bros., shoe manufacturers of Cincinnati, had established a common law Cincinnati, had ostablished a common law right to the use of the name "American Girl" as applied to shose. This mark is not registrable, as it is both geographical and descriptive. The planniff has used the mark continuously since 1896. In con-nection with the wording, there is a lady's head and the phrase: "A shoe as good as its name." Certain styles are designated by numerals, such as 644, 468 and 397. The defendant, a 84, Louis company, lorgan in use in 1890, as a trady-mark for shore The defendant, a 8t. Louis company, began to use in 1900 as a trade-mark for shoes, the words "American Lady," with a lady's picture. Later on they advertused "American Lady" shoes with the phrases "With the character of the woman" and "The shoe deserves its name." The numbers used but the convolution to desirants or desirants. shoo deserves its name." The numbers used by the complainant in designating styles were also taken by the defendant. The defendant, one of the largest shoe manufactures in the country, advertused the "American Lady" alone extensively, spending more than one hundred thousand dollars in publicity after suit had been brought by the complainant, (to take a few or the country in the dollars in publicity after suit had been brought by the complainant. On trial of the complainant's suit for damages, brought before the U. S Circuit Court, the defend ant's treasurer testified that objection to use of the name had been formally made by the complainant in 1901, but that he had considered a protest from a source so insigconsidered a protest from a source so inag-nificant as something of a poke, and had paid no attention to it. The only differ-ence is the use of "Lady" in the defen-dant's mark instead of "Girl;" the two being in all other respects essentially the same. Judgment was awarded the com-plaints. The defendant was forbidden to use the "American Lady" mark, and was referred to the court of the protection of the con-plaints. The defendant was forbidden to use the "American Lady" mark, and was referred to the court to the americants. ordered to turn over to the complainant all profits since the suit begun.

(To be continued.)

#### RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCHEMERICAN.

#### Ricctrical Bovices.

Electrical Bevices.

ELECTRIC LAT EXTENSIMINATOR.—J. W. M. CARMICHARI, 831 Commerce St., Wellisburg, W. V. This actornizator is simple and cheap of construction, and one, which, by means of an electric circuit arranged to be automatically closed by the animal as it passes into and through the apparetus, will



ELECTRIC RAT EXTERMINATOR.

kill the rat. A further object is to construct the apparatus so that the rat as It is killed will fail from the entering passage, and to which the circuit will be automatically opered preparatory to another operation. The ex-graving above a boughtudinal section view through the apparatus

through the apparatus

Of Intervest to Farmers.

Of Intervest to Farmers.

AND THE DESTROYBR.—H C. SKUEBER

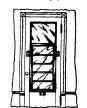
AND C. L. RYMOTON, Richland, Mo. This invention pertains to agricultural nucelines, and
the sim is to provide a growth destroyer more
especially designed for use on land that has
been cleared of tulner, to destroy the sproud
and effective manner. For this purpose use



is made of a wheeled vehicle adapted to be moved over the ground and provided with a revoluble beater having flexible arms adapted to forcibly strike and cut off the growth at or near the ground surface The illustration shows a sectional side elevation of the appa-

#### Of General Interest

Of General Interest.
COMBINED DOOR AND SHOW CASS.—A.
L. JOHNSON, St. Petersburg, Fig. This invention comprises a show case statchment for interedoor, to enable the door to be used for exhibiting samples of merchant's stock, that saving the space usually devoted to show cases when placed upon considers of the store and increasing the amount of available space which is used for show purposes in the wife



COMBINED DOOR AND SHOW CASE

dows. By using gisss in the construction, the articles on exhibition can be viewed through either the frost or back and articles on the either the frost or back and articles on the lower shelves can be seen through the upper cones on around of the transparent nature of the material of the shelves. The engraving shows a rear elevation of a store door, with a show case in place thereon.

Billive case to power converses.

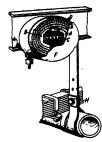
Hardware and Tools,
LINW HOLDER.—G. M. Vacoura, 112 Falcview Ave, W. New Brighton, S. I., New Took,
This healer is for use in this paiging roots, and
at other localities where it is desired to mark
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may be marked off serves a surface by operatling on one side only of the surface. It may be

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operated from at Shinades, and the mariting line changed from one location to such the such continuous and such continuous and

#### Pertaining to Vohisi

MEMICIAN SURBER—CLAUDE H. FOOTER, MEMICIAN SURBERS—CLAUDE H. FOOTER, 1407 Et. 40th St. Cleveland. Ohlo. This device prevents breakage and excessive rebounding of automobile springs. The circular base is divided into halves. A being clemped to the frame of the car and B being movable, supported on a stud in the easting A by a slewer, around which is a voil spring C. This two-piece base is enderted by four coils of Balasa which is firmly fastened at end A; the whole



being inclosed in a dust-proof steel case. Rprings move downward uninterruptedly, but excessive upward movement is retarded by friction and the car is kept from excessive swinging up and down. The device shown herewith is now in general use.

Derewith is now in genoral use. POUR WHERE DRIVE.—F. P. BRROMAN and H. CLARKE, Cheroler, Okia., care of S. R. Both, Cheroke, Okia. This invention is an improvement in four wheel drive mechanism, and has for its object the provision of a stimple mechanism by means of which power may be applied directly to each of the wheels of a relative, without faturefering with the turning of the relative.

of the vehicle.

TRACTION WHEEL.—J. BRARD, Veherans
Home, Laytonville, Cal. This invention refers to wheels for use with road locomotives,
traction segines, agricultural implements, etc.,
and more particularly to a wheel of the above
class, which comprises a revoluble rim having
radially moveshe fort, a series of freely movable guide rollers adapted to be ongaged by the
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Inquiry No. 9375. Wanted name and address manufacturer of stock patterns of plated job

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Ary No. 2250. Wanted manaz and addresses
althourars of machinery for studing dolls

day beart.

## Curious Megalithic Monuments of

France

The dolmens and roofed alleys of France appear in two forms; either entirely uncovered, or covered partly or wholly by mounds composed of stones, of earth, or of alternate layers of each. serrin, or or alternate inverse or euch.

Sometimes the base of the mound is surrounded by a circle of stones to keep the
mass of earth in place. The orientation
of these monuments is very variable. The entrance may be directed toward any point of the horizon, although according to M. Cartailhac it faces the east in the majority of southern dolmens. A flat stone, sometimes provided with a circu-lar, oval or rectangular appature, served as a door and protected the tomb from violation.

To these prehistoric monuments are at tached legends and superstitions which are reflected in the popular names of the are resected in the popular names of the monuments, Fairlee's Rock, Devil's Stone, Giant's Tomb, etc. The Celts and Gauls, impressed by the huge size of the dol-mens and menhirs erected by their predecessors, ascribed their construction to gods and heroes, and at a subsequent cessors, ascribed their construction to gods and heroes, and at a subsequent period the Gallo-Romans saw in them the intervention of Naints. In Gargantua's Tooth, Gargantua's Quoit, Saint Martin's Stone, and others, may be found rem-nants of the old worship of rocks, of which traces are preserved in all Pagan religions. Even Christianity failed to eradicate these beliefs, to which the rural population of Gaul long remained faith

These megalithic monuments must I be confounded with natural stone monuments, especially the rocking stones, which can be set into oscillation by a touch of the finger. Fig. 2 shows one of these stones, which is situated near Boussac. Contrary to old-time opinion, these rocking stones are simply freaks of nature, involving no human intervention.

menhir is a crude monolithic pillar a straight row of menhirs is called a colonnade and a ring of menhirs is called a cromlech. According to M. A. de Mortillet the whole number of French menand cromlechs, is 6,192. The distribution of the menhirs does not correspond to that of the dolmens. Both aboun I in Brittany, but few menhirs are found in the south-ern departments which are rich in doi-

The menhir of Locmariaquer (Morbihan) which attains the beight of 67 feet is the most remarkable of all. nately this colossal needle of granite was overthrown, probably by a stroke of light-ning, and broken into five pieces, four of which are now lying on the ground The original weight of the menhir is estimated by some writers at 250 tons, by others at 347 tons. At all events, this was the highest menhir in France. The second in rank, that of Plésidy (Côtes-du-Nord) is only about 37 feet high. A menhir of about 86 feet stands at Plouar-sel (Finistère) and one of 84 feet at Louargat (Côtes-du-Nord). The remaining menhirs of Brittany range from 16 to 30 feet in height. Those of Lampary (Fig. 4) and Chénat (Fig. 1), represent the average dimensions. The menhirs of southern and central France are much smaller. That of Davayat, the tallest in

Auvergne, is only about 15 feet high
The purpose for which these monuments
were erected is still a mystery. Some
archeologists regard them as primitive idols, others as monuments erected in idols, others as monuments erocted in commemoration of great historical events. It is quite possible that different menhirs were erected for very different purposes. The signatic needle of Locameria-quer and the little mentir of six or ten feet in height have little in common with each other. Some of the menhirs may be simple boundary marks, which have the contract of the comment of the commen

or religious significance.

The large menhirs, however, are probably religious monuments. The strange femer to the state of the state

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introduction of Christianity into Gaul, the missionaries, not daring to over-throw these ancient sacred stones, sur-mounted or marked some of them with

those of Carnac (Morbinan), which extend length of 19 miles from east to west They are distributed in three groups, sep arated by vacant spaces, and designs by the names of the villages of Me kermarie and kerlescan. The Menec group comprises 1,109 memirs, arranged in eleven colonnades and one circle or cromlech. The Kemarie group contains 982 menhirs arranged in ten rows, and the Kerlescan group contains 579 menhirs, of which 39 form a cromlech and the rest are arranged in 13 rows. North of Carc are extensive colonnades, consisting of 1.120 menhirs arranged in 10 lines and covering an area of 6,900 by 210 feet. The colonnades of Plouharnel, Peumarch, etc., are much smaller.

In other places cromlechs are found iso lated and not connected with colonnades and avenues. The most typical monuments of this category are the twin crom lechs of Er-Lanic (Morbinan). The two cromlechs are tangent to each other, and one is now partly covered by the sea, even at low tide. The diameter of the imperfect circles varies from 180 to 197 feet. The numerous polished stone hatchets pieces of crude pottery, granite milistone and primitive tools found in this vicinity indicate that these cromlechs served some other purpose than the retention of funeral mounds. Many hypotheses have been formed in regard to the purpose of the colonnades and cromlechs. Are they temples of the sun, places of sacrifice, or commemorative monuments? The study of their architecture and of the traditions attached to them will possibly solve the problem some day, but at present serious archeologists are content to classify and remarkable prehistoric ruins, without indulging in fantastic con-

### Smoke, the Destroyer

draperies and paper are soiled much more quickly in a smoky city than elsewhere If light paper is used in covering the walls, it must be cleaned every six months and new paper put on every year to keep it looking only half as well as quantity of energy which may be considone would wish.

The acid in the soot attacks draperies rendering them useless in a short time The extra wear of cleaning materially shortens the life On interior painting the effect is not as marked because clean ing is done about every so often anyway But the problem of interior decoration and keeping the outside of a building clean is a problem, indeed, and next to an impossibility in some smoky places. The statement has been made to me by a num ber of painters that they have done Jobs which looked really as had after two or three days as they did before they were painted Soot certainly destroys usthetic value of paint very quickly. batetee time which it takes to accomplish the pollution is, of course, dependent upon the amount of soot in the sir, the color of the paint, the tar in the soot, etc. The number of paintings required to keep the same building as presentable as in a smoke free city will naturally vary great ly Cases can be cited where it is r sary to paint three or four times as often as would be required for protection. the majority of cases in smoky cities cases in smoky cities the amount of painting is probably doubled. Sometimes it is necessary to remove the soot and the tar and to wash the build ing before applying the next coat of paint. This washing also removes the paint, often making necessary two coats in place of one for a proper covering. After the wood has received ten to twelve costs it is sustomary to burn off the paint. This is an additional expense and likewise endangers the house by fire. The action of soot on the wearing qualities of the paint also depends on many factors involving the chemical composition of the paint and the soot. The soot may be said, neutral

even slightly alkaline. Places are known where the soot in reality acts as a protective coating, and this is probably the case for the most part. Others claim that it is corresive to the paint surface, that it is corrosive to the paint surrace, destroying the gloss and rendering it much more easily weathered. This is probably true in those cases where the coal burned contains a lot of sulphur and the out is consequently very strongly acid.

Feeding the Body With Electricity AT the Science Advancement Congrated At Bordeaux, Prof. Berge Aheld at Bordeaux, Prof. Bergonie brought out the somewhat startling fact that the electric current can serve to some extent in the place of nourishment for the human body. Should this idea be car-ried to its fullest limits it may be possible to dispense with taking food and simply remain for a few minutes in a high-frequency electric case so as to have the body saturated with what might be called electrical nourishment, or in more accurate language the electric currents act to restore energy to the human h in a manner which is analogous to the offect of food. When high frequency cur rents first began to be used, as Prof. Ber gonié says, it was shown by D'Arsonva that these could set up very striking heat effects in the organism, so that the human body is internally heated. Owing to their harmless action, no other effect than development of heat is produced. The liver, heart or brain can receive the high-fre quency currents without any bad effect upon their working. Thus the current can supply as large an amount of energy as is desired to the human body, provide the best is not brought too high so as to cause death of the protoplasm as occurs in Dr. Doyen's electro-coagulation method. But it is not hard to keep within the pr er limits, and no danger need occur. With some organisms which are weakened on account of their being deprived of nourishment for any cause, the general temerature may become lowered even by two degrees A person can thus lose a quantity of heat which is represented by one twelfth of the daily ration of that organism. It is, therefore, a wonderful result to make up for this deficit without calling upon the digestive organs and without increasing one's daily ration, also without introducing any drugs into the blood or tissues. Electricity allows of sending a erable into the living organism under the form of high-frequency and low-tension currents, and this action can be reis often as is needed. experiments made at the Bordeaux college, overworked or enfeebled persons anemics and the like, showed that the current caused a toning up of the sys Force reappeared and he found a considerable gain in weight. Commenting or this, he remarks that we once thought that chemistry would solve the problem of food, and that we could be nourished by chemical products. But this does not ap-pear to be realized even in this age of progress. Perhaps electricity will now be able to come in where chemistry failed, and in the future ages we will be elec

### Military Aviation Abroad By the Paris Correspondent of the Scientific American

A BERLIN correspondent of the Paris daily journals states that Prince Henry of Prussia is engaged upon an aerial mitrailleuse which is being worked BERLIN correspondent of the Paris with in secret, but some of the details are known at present. The mitraillense is mounted upon an aeroplane so that it can be aimed directly by the movement of the is amount of the pilet's seat upon the framework. It is thus simed by raising or lowering the sareplane as a whole by using the rudder, and a side displacement is secured in a like a site cospacement is several at a same manner. A single pilot thus serves for dying as well as firing, and the result takes place always according to the direction of flight so that there is no de It appears that this is the



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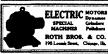
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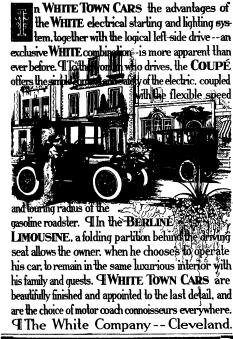


army has been engaged in following for

may be made some exceptions to the above statements. On one hand, it is claimed that the German army will be able to put out as many seroplanes as the French, and should this be true, the addition of the "destroyers" will give them an dvantage, at least for the time. ever, it is stated that ordinary aeroplanes will be able to make as high a speed as the destroyers, so that they will be out of danger The Russian army, in fact, ordered about 100 aeroplanes from the Paris Nieuport establishment about the first of the year, these being of the two-place type, and will be used for scouting purposes. They are to make a speed of 75 miles an hour, so that even should the German aeroplanes have a slightly great er speed, they will not reach the enemy before he is ready to alight in a safe place. Again, the Russian army is also engaged in building aeroplane destroyers of a similar kind, and have already or dered a number of these from a French

#### Salving the Steamer "Jose"

under the "Jose" was a long, tedious and difficult one, that of raising the ve after the chains had been passed under it was far more delicate and required a great deal of skill based on long experince in such work. The tension on the chains had to be regulated to a nicety that each would bear its own share of the burden, and here is where the practice of years in wrecking showed itself. No instruments were employed for testing the tension on the chains. Practical judg Practical judgment and experience alone were used. To raise the wreck the pontoons were filled with water, sinking them as far as practicable, and at low tide the slack of practic the chains was taken in and their tension adjusted. Then as the tide rose the pon toons were pumped dry, and with the toons were pumped dry, and with the combined lift of the postroons and the tide, the vessel was raised out of the pocket in which it had lain and was towed off. When it grounded the wreck was allowed to rest on the bottom at high tide, and at low tide the ponthous were dilest again, the slack in the chains was taken up and then with the rising of the tide the ponto were pumped dry and the vessel were pumped any and the vesses was lifted enough to energy it farther. This process was repeated until the decks were clear when the divers extered the vessel, and closed all the ports. Then the ship was pumped their or water and floated.







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You will bear witness that the Cadillac case has never been overstated.

Hold to that thought, please, in considering what we shall say of this new car.

Cadillac practice has progressively improved upon itself season after season.

It has now reached a point, which, we believe, warrants us in thinking that comparison of the choicest cars with the Cadillac will hereafter confer a distinction upon those cars, rather than otherwise.

For several years we have calmly observed the rapid rise of the Cadillac in public opinion.

Each year we have seen the little group of its equals in popular esteem narrowed down.

Each year we have seen a higher and higher price named as the basis of comparison with the Cadillac.

And we believe that basis of price comparison is about to vanish altogether.

We believe that the last mental reservation is about to remove itself from the public mind.

We ourselves have felt serenely sure for a long time that in point of real and substantial value the line of demarcation between cars of highest price and the Cadillac was an imaginary line.

We have felt that it was written in water, like the international boundary lines in the ocean—and we feel that this new Cadillac will complete the process of so convincing the public.

The advent of such a car at the Cadillac price is, of course, a matter of genuine moment; and you will be interested, therefore, in this news concerning it.

#### A few of the improvements in the 1913 Cadillac

LONG STROKE ENGINE: 434" bore by 554" stroke, increasing the power of the always extraordinarily efficient Cadillac engine. This amplification of power is especially observable at speeds from 12 to 35 miles an hour, dynamometer tests registering an increase of from 18 to 25 per cent.

SILENT CHAIN-DRIVEN cam shaft, also pump and generator shaft, replacing meshed gears, in conjunction with:

ENCLOSED VALVES, and the superb workmanship throughout in which the Cadillac has always excelled, producing an engine which runs with unusual quietness.

CARBURETOR: A carburetor of marked efficiency and simplicity has been further simplified, now requiring but a single means of adjustment, removing from it to the greatest possible degree, the necessity of attention. AUTOMATIC ELECTRIC CRANKING DEVICE, ELECTRIC LIGHTS, IGNITION:
A vastly simplified and improved Delco system developed at the instigation of the Cadillac Company for Cadillac cars, the result of experience with the old system on twelve thousand 1912 models.

old system on twelve thousand 1912 models.

While the old system demonstrated itself to be by far the most efficient for its purposes that had ever been developed, the Cadillac Company has evolved means of increasing that efficiency to as near the 100 per cent point as any mechanical appliance could be Among the simplifications are, the successful adoption of the single instead of double voltage system, thereby eliminating the controlling switch, the meter, much wring and other parts. The meter is replaced by a voltage regulator which automatically governs the charging rate of the battery, reducing to an absolute minimum the attention required on the part of the user. The switches for starting, lighting and

ignition, the latter equipped with Yale lock, are more conveniently located Lights are provided with fuses. These and other advantages will be enjoyed by users of the 1913 Cadillac.

AUTOMATIC SPARK CONTROL: Relieving the driver of the necessity of constant attention in order to secure the maximum results.

LONGER WHEELBASE: The easy riding qualities of a car which has been regarded as the acme of luxury are accentuated by an increase in the length of the wheel base from 116 to 120 inches, and a corresponding increase in the length of rear

TIRES: Increased from 36"x 4" to 36"x 4\%", with the obvious advantages resulting therefrom. Demountable rims.

EQUIPMENT: Cadillac top and windshield included. See specifications.

ENGINE—Long stroke, 4 if-lach bore by 5 %-lach stroke, fourcivilinir, dient inhin-driven cain aftal also using any generator shark,
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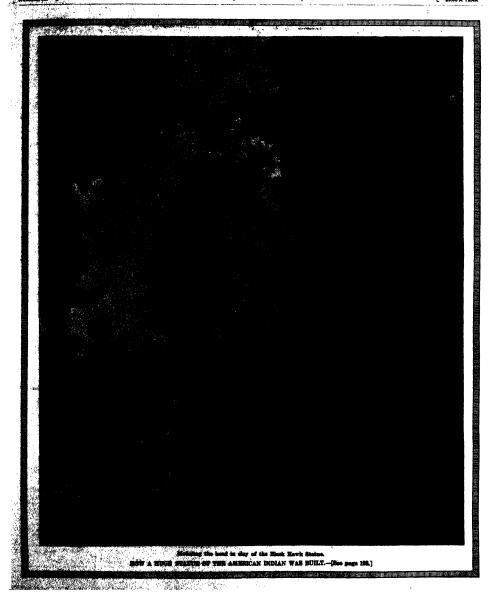
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# SCENTIFICAMERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, SEPTEMBER 7, 1912.

10 CENTS A COPY



# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, SEPTEMBER 7, 1912

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The Scientific American Public entific American (established 1845) . . . . . . . per year, lentific American Supplement (established 1876) . " The combined subscription rates and rates to foreign including Canada, will be furnished upon applicati Remit by nestal or express money order, bank draft or

#### Muan & Co., Inc., 361 Broadway, New York

The Editor is always giad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharps, the articles shard, and the facts distinction, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### The New Dispensation or Development of Children by Environment

UTHENICS, the sister science of eugenics, deals with race improvement through environment.
It studies the hygiene of the present generation, while eugenics deals with race improvement through heredity for future generations.

Enthanics teaches us that diseases themselves are not inherited, but the power to resist disease is in-herited, and unless this resistance is present a child is

liable to fall a prey to the ever present microbe Heredity and environment taken together produce a child's characteristic health, and as heredity is nothing more than stored environment, every mother has a chance to add to that store, so that her child's health can be better than his parents.

The following principles are used to encourage the nother whose child has one parent with a bad heredity:

1. The inheritance from the healthy parent is stronger than the inheritance from the diseased parent. A had inheritance can be overcome by a good environment.

A mother, whose child has tuberculous inheritance, should take great precautions to prevent him from contracting the disease. First, unless she be tuberculous she should nurse him herself.

Cows milk is the source of fully one half of the ases of intestinal tuberculosis in children, and when this disease is contracted under one year, it is nearly always faial. The greatest cause of infant mortality is due to the souring or growth of microbes in milk in hot weather.

any physicians prescribe an artificial milk food for children which requires only the addition of water, to prevent infection. The best way, though, is to avoid milk, unless you are perfectly sure that the cows have been tested for tuberculosis, and unless the milk is germ free or has been pasturized or sterilized.

A child's general diet at infancy, should be beef juice and orange juice in increasing amounts, from a few teaspoonfuls to several ounces from eight months on.

From two and a half to three years he should have
meat, which is finely scraped, well-mashed potatoes, and stewed fruits. The child should not have a diet composed largely of cereals or starches, for such a diet cannot supply the strength which a child needs for him to develop into a strong man or woman.

Next to the food, comes fresh air The child should

all his naps out of doors, and at night a window should always be open, but without too much moving currents of air.

As the child grows up he should have out-door games, because such amusements bring appetite, health and

The next important thing is to prevent contagion A nurse girl, who has tuberculosis, should never be put in charge of a child, and the child should never d on the mouth, no matter by whom it may be.

All children should be taught to be clean-to prevent all discuses, but especially tuberculosis. The finger nails and hands should be kept especially clean. He should never use a drinking cup that another has used or even a glass that has been fingered.

#### The Half-mad

The Haff-mand

The Ha

w has, in the course of civilization con stantly been changing. That of the present day is quite ultre-actentific, having been developed from the "rationalism" of Voltaire in the eighteenth century; it is a finding which will certainly be modified by fu-ture generations. For it considers many insane, or at less thair-mad, who in other ages were rightly lauded as gentuses, saints, benefactors and world-compellers, It ignores the legendary, which is so fundamental in human nature, and so dear to humanity; it takes no account of the emotional, the poetic, the soul-stirring— entities, which after all make living the most worth

Prof. J. Grasset, of the University of Montpeliar, has in his book "Demi-fous et Demi-responsables," designated as half-insane (Lombroso would have deemed them afflicted with "genius-insanity") such men as l'ascal, Comte, Balsac, Hugo, Molière, Wagner, Schiller, Descartes, Cromwell, Goethe, Mozart, Byron Tulstoi, Ampère, Dante, Columbus-even Simkespeore and many another. Obviously, when one consider such men demi-fous, there is something wrong with the definition. Did St. Paul or St. Francis see visious? What would civilization be if they had not? Did Beethoven "rough-house" the homes of his princely friends who sought to relieve his needs? What matter to any one who has heard the Ninth Symphony? Was Caesar an epileptic? Was Napoleon a degenerate and a hypoan opticptic? Was reported and organizate and a hypo-chondriac? Was poor Chopiu's immortal music thinged with the toxemia of his consumption? Was Pos an alcoholic? Schopenhauer a misanthrope? Did Newton abstractedly stick his flance's finger into his lighted abstractedly sites his passees a major into his manner pipe? (He died a bachelor.) Did Dr. Holmes' neigh-bors doubt his sanity when he put out (so it is chron-icled) a sign "Small fevers thankfully received?" Darwin used to surprise his friends by starting all sorts of apparently crazy experiments. Of what matter all these things; of what use to call such men as these neurotics, or hysterics or demi-fous? Where would humankind be to-day had not they, and such as they, lived? Who would not, if he could, be in such company?

Grasset most wisely refuses, as is generally done, to divide humanity into two hard and fast groups, the sane and the insane; the group which is or should be placed in confinement, and that which confines it. Part of his work is given to the discussion of Semi-responsibility. Limited Responsibility and Attenuated Responsibility, to the end that such distinctions may place in French jurisprudence have already been accepted in many continental courts though not at all in our own or in those of Great

#### Limitations of the Aeroplane

Limitations of the Aerophane
URFACES are measured in square feet; volume in cubic feet. An aeroplane is a surface
horisontally driven through the air. The
amount which it can support varies with the speed
and with the area of that surface. An increase in
the weight to be supported necessitates a considerable increase in the area of the supporting surface.
Although the cubical contents of the weight may increase only slightly, the number of square feet in the supporting surface may increase considerably. For the present at least there is a limit to the size of supporting surfaces. As it is, the difficulty of properly securing and holding in place the wings of a modern monoplane is such that there is little, if any, room for that factor of safety which is considered so essential in the construction of bridges and: ered so essential m use construction of transportation tall buildings. There is good reason to believe the some of the most serious accidents which have occurred in the last year have been due to the collapse of improperly supported wings:

Great loads, as the history of transportation teaches

Great loads, as the history of transportation teaches us, on the conomically careful only by great machines. That is the lesson taught by the modern 44,000-ten steamer and the 425-ten homometries. Small crews, controlling machinery of enormous power, are able to guide gigantic loads safely to their destinations. At present the aeroplanes is piloted as a rule by one part of the controlling machinery of the controlling machinery of enormous power, are able to guide gigantic loads safely to their destinations. At present the seroplane is picted as a rule by one man, and it carries one or two passengers only. For that reason, if the semplene of to-day were to be used for passenger transportetion, an esserbitant fare would have to be changed. (Only by increasing the piece of the seroplane wastly will it be possible to use it as a means of commercial transport; and the increas-in size is impossible because of the difficulty of increas-

all slong the rear edge, and the further size placing these rudders not only along the size but as a considerable deitance basis, and of six them in outsale framework. Definition formidable would arise in properly disposing providing operating means for the wing slow. It is not inconservable that see insulated, sliby more, passenges might be searfed by a than constructed. It is probable that the cong machine would rise from the ground and the time on a percenty column day. To what it, would be no easy marker. No doubt it would be now to mount the machine on a series of small would be no easy matter. No doubt it would be incessed to incount the machine one a series of small, wheels rearry to incount the machine one a series of small, wheels remaining on many pacable with. Landing while he not of the question in a prefer to also; but in a former it might be fraught with disastor. Even in eligible in the many continued and the small state of the saint a combined machine would not be easily offer and a surface that the air pressure would not be evenly like tributed. Stresses might be set up which mights well break the machine in flight. I magine in place of this huge combined surface a fook of scorphase flying closely together in the same horizontal plane, assuming that the wash of the propellers would not interfere. A gust which

name normanism mass, assuming case are mass or the propellers would not interfere. A gust which happened to strike the scroplanes of one side only would raise them above the horizontal plane in which they were all flying. If the flock of acceptance were rigidly connected, it is manifest that the commentions

rigidly connected, it is manifest that the commentum would amp. It is apparent that an accoplant's carrying capacity increases in proportion to its surface, and that the engineering active of a frying machine decreases in anato proportion to the surface exposed to the wind. None of these objections applies to the dieigible sirabit. There is no engineering difficulty in constructing a gas law of any size. Indeed, the same advantages that can be claimed for the large steamship and the large incomittee can be claimed with equal forces for the large dirigible. Even now, when the cost of constructing and constature, a dirigible is equal force for the large dirightse. Even now, when the cost of constructing and operating a dirightle is alarming, the advantage is all with the gas bag when it comes to carrying loads cheaply. All the recourses of modern engineering can be employed in the airship to obtain great strongth with very little weight. As the linear dimensions of the simbly increases, its sur-ce decreases in reconstruction to the 10°C. The terroisthe linear dimensions of the sirabily increases, its sur-nee decreases in proportion to the lift. The impo-sibility of increasing the vertical dimensions of an aeroplane without increasing weight that has no lifting offect, confines the engineer to an extramely shallow effect, confines the engineer to an extremely shallow girder depth, which is the real reason of the scroplane's frailty. On the other hand, the dirightie, which is great girder depth in every direction, for the same proportionate weight can be made remarkably strong. In a dirightle size counts in every direction; a linear increase up and down meass jout as much lift as a linear increase fore and aft, or right and left. If it were possible to build an accoplane of great size without materialty increasing its weight and frailty, it would be possible simply to easyr many passengers with a few trained pilots and to fly somewhat faster and for somewhat longer periods than is at present possible with a small machine. In a very large ser-possible with a small machine. In a very large ser-plane the load can be cut down, to a certain estent,

possible with a small machine. In a very large serve-plane the load can be out down, to a certain extent, in favor of more powerful motors, and more fuel. In the small machine this would be equivalent to angusta-ing logs and arms. In stability, safety and navigability, saroplanes gain by a compensatively moderate instease in size, which might worder it possible to carry in con-tor several pilots, 'engineers, and motors, and to install elaborate colarbeility devices and unvigating instr-ments. The possibility of increasing the data, however, in soon brought to a delatte limit, for the reasons given.

is soon brought to a deficite limit, for the reasons given. The Northeast Papeage

Radon Northeast Papeage

Albon Northeast Papeage

Talanger and Walastach, now engaged in a severy large expedition stong the docate of Kantochatin same the coasts of Kantochatin same the coasts of Kantochatin same the coasts of Kantochatin same tree coasts of Kantochatin same severy large expedition, however, in detail command in the command of the Comman for Linear, Schotchate Spane, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under these coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the coasts of the Northeast Reason, but to under the Northeast R

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contesting, it is decorated to recommend uncome or discount of dynamically. Trigitizes Trailoys for Shunsing,—An interesting application of trachices trailoys is being, made at Alisana, Germany, for the chanting of brights sers,. The freeless locamotive in use since 1000 will be replaced by mechanic activation arigid and explicate the property of the schematic partial of the tracker, is designed for driving on either side to a mandaman distance of 3½ meters (1.1½ fact), so as to Alice while tracker to traval on either side to a mandaman distance of a series of the shunsing service, and the leading of cars is not interfered with. The interior which is the sufficient for the shunsing service, and the leading of cars is not interfered with. The interior which is to ease with their fail lead at a speed of 2 kilomators to it kilomators (1.85 to 3.73 miles) and is worked by a 35 horse-power continuous surrent mater at 550 volys, chriting all four wheels through a 10:1 worm gear. The coupling derive is operated from the driver's stand, so that the brakeman need not pass hetween the buffer. The shurting films is 1.2 kilomators (5 miles) long, and reaches as far as the boundary of Hamburg.

ray inspirate mas is a final control of Ranghoup.

Takiphones in the Datied States and Racon.—According to a bulletisk issued by the New York: Relaphone and Takipton Company, the United States and Takipton Company, the United States leads the world in the total number of teleghones by a wide margin. There are in the United States 67-4 per cent of all the telephones, and ourly 20-32 per cent in Burupa. As against our neven and one half million telephones, the German Ranghes has but little over one million, while German Ranghes has but little over one million, while German Ranghes has but their over one million, while German Reteasts are the same of the same o Property Name

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about 14 pound per yard.

A Great Reservish for Ruenne Alrea.—According to
the London Nomerical Times the largest elevated reservoir in the world is about to be erected at Cabalitio,
near Business Alrea, its connection with the sanitary improvisions a technical of the Argentine capital. It will
consist of three iders of wrought-iron tanks supported
sits east-iron columns embedded in heavy concrete
foundations. The total capacity will be 10,000,000
gallons, and the structure will be 126,000,000
gallons, and some the second the columns to the tap of the red. It will contain 15,460 tons of lives and store, The contract has
been awarded in England.

heen awarded in England.

Actd-preef Ireis Gennanthum—less alloys containing a certain perestages of chromium are usually employed in the manufactures of articles and apparatus visible should resist the settion of adds. These compositions are, however, not shoulstoly said proof. Recently the well-known Gennan metalurgait, Prof. Significant of Air-in-Chapalle, dissovared that by adding salely-denum to an iron composition constaining more than 10 per cent chromium, in amenutes of 2-5 per cent, an abouttly said-gend composition content, and the contrained. It is essential, however, that the iron be free from earlien, or at least heady or. A examposition containing 35 per cent from orderin, or at least heady or. A examposition containing 35 per cent from, 60 per cent chromium and 5 per cent polybelenum, but is delamed, remains unaffected even by hot squa majos. This alloy has the tenacity of cest iron and cast be worked like the latter. Trianium and vianadium, may be used leasted of mothebaum, but the latter is prefugnile.

Reterorelogical fitstians in Assarction.—With refer-

can sweet is procupated.

Mateoreological Stations in Assayedas.—With reference to a permittent runner of great laterest to meteorological service of Australia, says in a personal letter: "There was some talk before the Mawson Expedition went south about establishing a permanent mesorological station on the soust of Antarotics, but what the probabilities are not permitted to be become station on the coast of Antarotica, but what the pron-abilities or even possibilities are will not be known until the expedition returns and reports upon conditions down there." A much bolder plan recently set forth by Admiral Peary in an American magazine contemplates the establishment and maintenance for a year of a the establishment and maintenance for a year of a susquiffication at the four Pool itself. Meconological chaperations would be the most important part of its preparature. From several other quarters come hints of the fact that there is a decided drift of opinion toward the imangument of a campaign of meteorological ob-mervations as fixed stations in outh polar regions analous to the one carried out in the arctic regions in 1881-83.

servations at fixed stations in south pour regions assau-quous to the mose carried out in the arctive regions in 1881-82. Hagilits flasywood for Trimming Hats.—According to a recent summer at the Daily Consular and Trade Reports a rather simulal liquitry along the Kentish coast has come to public attention through a complaint lodged with the Kent Fisheries Committee. The inhabitants of the Lies of Grests and the adjoining districts on the cast coast of Kent, have for many years been collecting a white seawed that is washed up along the shore, which seawed the been used by London and provincial mil-liners as a feliuming for women's latz. This, it seems, has given last of prediction industry during the winter incosts, where lifen; work is not to be had. Its con-tinuation is threatened by the practice of trawless who attach harded wires to their tawyis and gather the white most the state of the colleger way, the seawed falls off regus the roots and is washed ashore but the trawis pail it up by the norse and time destroy the source of supply, healthe beaving nothing for the islanders to collect but the request than heat therew healt thos the near by the invitors. It was asked, among these

source of supply, besides leaving nothing for the islanders is collect by it her wines that has been thrown back into the san ky the terretery. It was asked, among other things, that a closed meanly for the word to adopted. The Free Memorial of Decembe. Measless—The Curre Memorial is a list collect after its discover, Vanquere del Memorials, is described in a seamt countain report. Reminded proposition to a seamt countain report. Reminded proposition to a seamt countain report. Reminded proposition is a seamt countain report. The memorials report of Memorials in the proposition of the world. The memorials report of the supple of the suppl

#### Aeronautica

Delivering a Flying Machine by Air.—A Caudron bi-plane was receivly delivered by the maker to Commander Fellix et B. Cyr. The distance from Crotoy to the point of delivery was ninety-six miles, which was covered in one hour and a half at an altitude of about four thousand feet.

The Taiking Machine and the Aeroplane use was made of the talking machine recently in a Far-man biplane. A passenger dictated his observations, which were made on a record of specially strong ma-terial. This was then carefully wrapped and thrown to the ground, where the record was reproduced. How saful the experiment was, we are unable to learn.

Launcher for Aeroplanes.—In patent No. 1,033,148, to W. A. Bond of Lynn, Mass., assigned to Andrew M. Johnson of Lynn, there is shown a carriage adapted to support a flying machine. This carriage swings horizontally about a vertical axis and when the desired he carriage is obtained, the avia speed of the carriage is opinined, who much the fiving machine so it can be thrown off from the

A Spisadid Record for Military Aviators.—Lieuta.
Vardus and Battini, who are among the leading military plots of the Maurice Farman seroplanes, recently returned to the St. Cyr arevodome after a six months' absence, during which they were engaged in souting work of various kinds with the Mailly camp as a centre what is to be noticed in that they covered more than 12,000 miles and took about 600 passengers on these trips, these being officers who acted as scouts. All the flights took place without any accident and the aeroplanes are

Franch Wireless Experiments.—The French officers present wavever appermenta.—In Present of merer arregions convey ever you down with aeropianes carrying wireless apparatus and within a recent period the results are improving. The latest experiments were made by Lieut. M. de Varennes. Mounted on a Framan aeropiane he left the St. Cyr grounds near Versailles, oarrying the telegraph operator Duriveau. He made a flight to Amiess, and was able to keep up wireless connection with America, and was note to keep up wherease continued to the starting point when at a distance of 50 miles. No doubt a greater distance could have been covered but a violent storm prevented any further work on that day, Seeing that St. Cyr lies in a deep valley, the experiment was a more difficult one.

A French Military Postal Service.-- A military serial postal service is being started in the French army, and during the first trials the results showed all that could be expected. Lieut. Nicaud, mounted on a Farman biplane with Gnome motor, taking the officer Million as observer, what chome motor, taking the omner Aminon as observer, made a flight at 8:45 A. M. from the Verdun camp, and after a trip at a very high altitude above the country in the east of France, he made a landing at the town of Nancy which is one of the leading milliary centers near the eastern frontier. The officers are charged with the postal service for the army and take letters which have s special aviation stamp upon them. There is that this service will be extended in the future. There is no doubt

Military Aviation in Russia.-The Russian army is actively taking up the acroplane question at present. Not long ago two of the officers made a brilliant performance. Capt. Andredi is the first to make the flight ance. Capt. America is the first to make the argue between Sehastopol, Odessa, Moscow and St. Petersburg, occupring no less than 1.800 miles on this occurion. Lieut. Dibowski also made a cross-county flight of nearly the Dibowaki also made a cross-county flight of nearly the eases distance, both upon Nieuport monoplanes. The war department is taking measures to have seroplanes of in connection with the coming military manauvers, and thay are to be used alone, without employing ari-salips on this coosaim. At the Riementief artillery fring grounds near Moscow, seruplanes are soon to be used for observing and reporting the effect of the firing, and at the same point teets as to firing upon serial objects will be carried on, using kites drawn by automobiles as a mark in the first place

in the mer piaco.

The English Military Competition.—In a review of
the military competition held at Salisbury Plains last
August, the editor of Piphi comments: "Some of the
taginate have lost many a brilliant opportunity of impressing the authorities with the capabilities of their
machines. Thus, the weather conditions have been
enceptionally bad, but we have seen the spectacle of a
whole Frying Corps sating and watching in vain for
Rights which, while not in the nature of observed tests,
watch nevertheless have impressed the army authorities Hights which, while not in the nature of observed tests, would nevertheless have impressed the army suthernizes with a sense of what may be called the weatherliness of the modern seroplane. There is a difference between taking what are really fertiumate risks and staying in the hangars with an obvious idea that price rather than londers for machines were the main object in view."
This seams to have been the chief cause for criticism. This seems to have been the chief cause for criticism.

Figish sho points out that once more the need of an disional, trustworthy engine was brought to view.

Reviews motor defects prevented at least two machines from socomplishing anything noteworthy. Others were far from socomonical in the consumption of lubri-

# A Novel Use of Cement in Sculpture

### How the Statue to the American Indian Was Built

By John G. Prasuhn
model were drawn on the model by outlining all straight
lines and that surfaces, and numbering the points with

a specially constructed machine, at the termination of

M ANY articles of literary merit have been written on Mr. Lorado Taft's concrete statue to the American Indian, but these have not made quite clear the

ican Indian, but these have technical side of the question—the methods canployed in the construction. The writer, as builder, has been requested to set forth in simple technical terms the methods used in the building of tibe—set far as the writer is aware—the first heroic cement struce, which was dedicated mear Oregon, Ill., on July let, 1011, and which has been open to the public view and criticism ever since the large plaster mold was taken off in the early

spring

This statue, standing on English Not Blind, 250 feet above the Rock River, is 45 feet 4 inches in height. Five feet of the 14-foot Shinh pedectal is exposed. From the end of the steel reinforcing rode, 2 feet in solid rock, to the top of the head it measures an even 60 feet. The statue contains about two tons of twisted steel reinforcing rode and approximately 238 cubic yards of concrete, twenty tons of which are one-fourth fach to dust pink grantle screenings for the surface, giving it the appearance of a grantle

Approximately 65,000 gallons of water were pumped up from the river for maintaining two steam engines, and for mixing the cement. Four houdred and twelve barrels of Portland cement were used and the mixture was as follows: for the base 1 and 5; for the pedestal and steps going down into the statue, 1 and 4; for the figure, 1 and 8, and grante screenings, 1 to 1½, mixed with a water-provide compound compound.

An is ensionary with most scuiptory, the idea of a new work is expressed in the form of a sketch model. In this case the first model was only 8 inches high. The next size was 2 feet, and the third size of feet. This hast served as the working model. Then asystem was devised by which the enlargement was much, and when fluished the enlargement was no evact duplicate of the 6-foot model, increased swent times.

In locating the site, a 24-foot silhoutette was abuilt, which was found to be too small from the point of view desired. Then a light 42-foot structure was erected on a farm-wagon, and the wagon was drawn around until the proper location was established.

The site having been chosen, a square central tower was built to the height of 35 feet and anchored with guy wires. Plans for renlarging the

The wooden structure cov-



The mold suspended



Hoisting the temporary head with



Concrete statue of an American Indian at Oregon, Ill.



Taking off the piece mold.



Changing off the mold.

these straight lines and flat surfaces. A section of the surface of the model could be enlarged on the ground and drawn up by a rope, and nailed in place to corre-

spond to the model. After all the points were made to correspond to the plan on the working model, wire netting was used for the curves; this in turn was covered with 200 yards of burlap for a surface, the buciap being pinned to the wire with nails at close intervals.

A specially constructed derrick was used for the hoisting and setting of the temporary head, which had been previously modeled. This served two important purposes-that of marking precise location on the statue, and of facilitating the joining of the piece mold of the head to the mold of the figure. Aft After the figure was turned 15 degrees to the right to present a clearer profile from the bluff road. The final modeling was now done and the surface was given a thin coat of plaster to stiffen the burlap, and then a coat of clay-water to insure its release from the mold later on. Both coatings were applied with a force pump.

The mold on the figure

The mold on the figure was now made of plastor and fiber supported by four 30-foot I-be am so blocked up on cribbing timbers on a level with the top of the future pedestal. Every 4 or 6 square feet of the mold had independent bracing directly from the timbers on the L-beams, with strutting, cross bracing and hoops are on the L-beams, with strutting, cross bracing and hoops are unit of the structure, tending to equalitative the outward strain simposed by the cement. The structure was built to shoulder level, the piecemoid fitted to the bend and neck, and the two joined together in such a way as to be interlocking and self-supporting after the head had been removed and lowered in the same manner as it had been holsted up. Excavating was carried.

Excavating was carried on at the same time that the mold was being made While this was being done the figure was shored up by timbers from the solid rock if feet below the ground level. The central tower was retained as a scaffolding until the piece-mold of the head had been fitted. The interior was patched and cleened, and the interior of the mold was given two costs, one of wall size, and one of paraffine greane; the former to keep the plaster mold from the cement, and the latter to insure its release.

The remaining scaffolding was then taken out (Omeluded on page 495.)

official.

### SCIENTIFIC AMERICAN

# A Railway Car Driven by Gas and Electricity

#### A Substitute for Steam Trains Where the Traffic is Light

By the Berlin Correspondent of the Scientific American

THE Prussian State Railways have for some time I given special attention to the question of adopting motor railway cars on lines where there is little traffic. After carrying out preliminary trials with steam-driven zotor coaches, twin storage battery cars were used on a large scale, while more recently gasoline-electric cars are being adopted.

The first car of this type was placed in commission in the year 1907. In view of the experience gained with this coach, the gas-electric set was rearranged under the supervision of Mr. Wittfeld, expert to the Ministry of Public Works. Successful trial journeys show that the new coach offers a very satisfactory tion of the question.

The car body is supported on two 2-axle bogie trucks which are provided with triple springs. In order to prevent the vibrations set up by the motor from being prevent the vindrous set up to the motor from some transmitted to the car and to insure a ready access to the generating set for the purpose of inspection, both the combustion motor and the shunt-wound dynamo em-ployed for generating the electric current, together with its exciter, are mounted on one bogie truck.

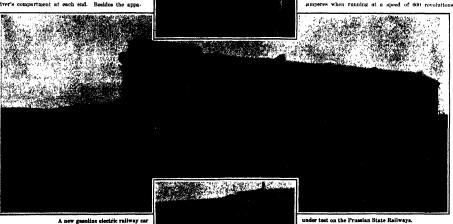
accommodates a total of 95 passengers in a third and driver's compartment at each end. Besides the appaApparatus in the driver's compartment.



plied by a compound-wound exciter having an output of 25 kilowatts at a pressure of 70 volts, which is mounted on the extended shaft of the dynamo. The car is driven by two railway motors, which in ecordance with the regulations of the German Society of Engineers, each have an hourly rating of 82 horse of 300 volts and a current of 230

nded in the frame of the lending bogie truck, and is totally inclosed, it is cooled artificially by means of a

No centrifugal fan The exciter current is sup-



A new gasoline electric railway car

ratus required for the control and braking of the car these compariments contain four and five folding seats, respectively, and serve for carrying heavy lug-gage which cannot be taken into the passengers' com-

A compressed-air brake of the Knorr type and a hand spindle brake are provided, both of which can be operated from either driver's compartment. The car is heated by water coming from the gusoline en-gine, which, before passing to the radiator mounted on the roof of the conch, flows through coils in the driver's and passengers' compartments. The gasoline engine, which was constructed by the Neue Automobile engine, which was constructed by the Neue Automonies Gessellschaft, is of a cylinder type, and produces 120 horse-power when running at a speed of 700 revolu-tions per minute. The motor is under the control of a centrifugal governor, but is fitted with a device by means of which the speed at no load can be reduced to 250 revolutions per minute. This device is oper-ated automatically from the controller. The cylinders are cast in pairs; the valves are all placed on one side and are actuated from a common shaft. The admission and outlet valves are of exactly the same dimensions and are interchangeable. The upper half of the crank-case comprises large openings at the side for inspecting the crank mechanism. The crank-shaft itself has four cranks set at angles of 90 degrees to one another, and is supported in bearings at three points All crank-shaft bearings are placed on the points. All crans-most bearings are passed on the upper half of the crans-case so that on removing the lower half, which is constructed of aluminium, the whole mechanism becomes accessible. A special point

er minute. With a genring ratio of 1:4315, the mo tors are capable of imparting a maximum speed to the coach, which has a total weight of 55 tons, includ-ing the passengers, of 65 kilometers (40 miles) per hour

The connections of the electrical equipment are carried out on the Ward-Leonard system, by altering the voltage of the generator; this arrangement meets all requirements of the service in a most perfect manner. The generator can, in fact, give at starting, when great tractive efforts are required, heavy currents at a low voltage, and the exact voltage can be obtained at the generator terminals in accordance with the speed of the motor. The combustion motor thus can always be run at a practically constant load and, therefore, at the most favorable speed and with the most economical consumption

The current for lighting the interior of the car and the signal lamps is supplied by the exciter and the battery connected in parallel with it when the generator set works at full speed. At a lower speed, and in particular when stopping at stations, the exciter is automatically switched off the lighting circuit, by means of a self-acting switch, when the battery alone feeds the lighting mains. The current necessary for the ignition of the combustion motor, for bell and the motor siren is taken from the battery; the charging of the battery is effected by connecting it to the exciter

This car was until recently placed at the disposal of the chief railway workshop, and has made a num-ber of trial journeys on the Tempelhof-Zossen line

was made of obtaining lightness combined with great strength in order to keep the vibrations s et up by the momentum of the masses as low as possible. A compressor fitted directly to the motor generates the compressed air required for braking the car and starting The current for the arc ignition is supplied by a Bosch high-tension magneto apparatus; an ordi-pary battery ignition is provided as a stand-by. All

The 120 horse-power generating set.

BOOK A SATURAL STORY OF SAME OF

# Recent Improvements in Electric Vehicles

### A Review of Important Patents Granted Within the Last Year

I T is remarkable to hote the extraordinary favor with which the electrical vehicle is being accepted in the commercial world to-day. This is due to two facts, nost, the natural and inheront advantages it has, because of extreme simplicity, and second, because it is bing developed and manufactured by reliable and conscientions firms who have carefully developed it, and who invariably guarantee their products.

scientings rims van dave bareaun; developes it, and who invariably guarantee their products. But popular as the electrical vehicle is at present it is bound to find far greater favor as its advantages become more appreciated. Furthermore many amount more more and the same products of the products of the more extended in the products of the more useful and extended in the products of the products of the radical changes in design or makeup; for the very first cars, manufactured are quite similar to the most monotoned modules to day.

The first thing that strikes one is the case of control, due to the fact that the electric motor requires no shiftable gears and no clutch mechanism. Starting is no simple and requires no more effort than turning on of an electric fan. By the use of a controller similar in principle to that used on the ordinary street car all the variations in speed up to full speed ahead or reverse can be obtained.

The use of 10% electric motor does away with noise, often and just that is a natural consequence of use of the possible cuttie. The absence of jerks and just gives longer life of the machiners, saves greatly on tires, and the metal parts of the frame are not subject to crystallitating and becoming brittle as are corresponding parts of a goodine car due to the incessant vibration.

In fact the mechanism of an electric car is so simple that there are really only two things upon which there can be any extensive improvement, i. e., the battery and the motor

As for the recent lungrovements in the lattery, no less a genius than Thomas A. Edison, the greatest American Inventor, has done much for the electrical vehicle in bringing out the utcket-from storage battery believe in bringing out the utcket-from storage battery which would be of less weight and of greater capacity which would be of less weight and of greater capacity than the previous lead battery. The old lead batteries were extremely heavy and had to be handled very carefully as they were quite fragile and subject to many diseases of all kinds which made handling of

an electrical vehicle somewhat problematical. Builson's battery is just half as heavy as a similar capacity battery of the old lead type. Hence, it is possible to curry more "stattery" and to increase the m age for a single charge. Only a few years ago the mineage radius of the pleasure vehicle was not over 25 miles, now with the Edison battery it is between 65 and 100

Another improvement (patent Pieper No. 1.098,827) makes it possible to charge the storage battery while the car is deeceding a grade. This allows "braking" of the car without actually applying the brakes, thus awing wear and at the same time storing up sensor. The control switch of this motor is so arranged, in running down hill, that the batteries are suttomatically connected with the motor as soon as the voltage is great enough to charge the battery.

great enough to catrage the obttery.

One drawback that has often been urged against electrical vehicles has been that it is not always convenient to obtain suitable charging current. In most cities lighting circuits are supplied with alternating current, which is unsuitable for charging betteries. One ingenious inventor (Bender No. 1,077,198) has solved this difficulty. He employs a motor made of two parts. One part is in reality an alternating current motor coupled directly on the same shaft as the other part, which is an ordinary direct current motor coupled.

By means of levers the motor shaft is disconnected from the driving shaft, and at the same time a controller switch is so conditioned that the alternating current motor can be run from ordinary 110-voit lighting circuits, turning on the same shaft with itself the direct current motor, which now becomes a generator and charges the storage battery. An automatic trip is arranged to shut off the machine and disconnect it curricy when the battery is fully charged. This invention promises to increase the field of use of the electrical vehicle, for the alternating current motor can be arranged to run on any desired circuit, but still the batteries can be charged in the usual way if desired. In ordinary use the alternating current motor acts as a dy-wheel and adds but a very little weight.

There have been developed within the last year several clever schemes to cut off the charging current when the storage battery has been fully charged. One inventor takes note of the fact that as soon as the

batteries are fully charged they begin to sive off gis. A rubber tube is connected with the vent of the cells and this leads to a pressure gage which opens the charging circuit when the gas pressure rises show a certain value.

Another inventor uses the increase in density of the liquid in the cells as a means for determining the extent to which the cells are charged and for cetting off charging current when the battery is fully charged. Edison has invented an ingenious scheme to prevent

Edison has invented an ingentous scheme to prevent the solution in the battery from passing off in gas during charging. The gas that is given off is caused by decomposition of the water. Now by putting a fine platinum wire inside the cell, and heating it while charging current is on, it is possible to cause the gases to recombine into water. Thus loss of liquid is prevented and refilling becomes necessary only at long intervals, if ever.

Another improvement of considerable note has been made in the transmission of power from the motor to the wheels. In most makes of cars in the past it has been the practice to use a chain drive. This is still most widely used on trucks and commercial vehicles, as the slight noise is of little consequence. But shart drive is now being employed by several of the most prominent manufacturers, as it is silent and can be completely inclosed, giving a picesting and highly finished appearance. To surpass this another ingenious inventor has patented a scheme whereby the motor is mounted concentracily with the rear saite. The casing appears no larger than the ordinary differential housing on a gasoline car. The casing is made wateright and the inventor states that he can run the carright through a stream even with the whools and motor completely under water without the least damage.

In commercial vehicles it is important to have considerable tractive or pulling power, especially where there are no payments. This has been attended to by several inventors, one inventor has perfected a scheme whereby power is applied to all four wheels at the same time. This is arranged so as not to interfere at all with steering, and is a valuable improvement. Another inventor has added two more wheels, making six in all, and has arranged to have all of them drives, thus obtaining a great tractive effort at all times, regardless of the position of the car.

#### Oil-mixed Portland Cement Concrete

ORDINARY Forthand cement concrete, because of the hasorptive qualities, is used in some structures with only partial success. When made proof against the permention of moisture, not only is its field of use-fluiness rendered more universal, but its efficiency is likewise greatly increased. A bulletin from the pen of Logan Waller Page, director of the Office of Public Bonds of the United States Department of Agriculture, explains a very simple method for damap-proofing correcte by the incorporation of mineral oil residuum with the ordinary concrete instance II also describes the application of distincted Portland cement concrete to several much used types of structures in which a damap-proofied building material will be of benefit.

While experimenting in the Officer of Public Roads in an attempt to develop a non-absorbent, resilient, and dustless road material, one equated of withstanding the severe shearing and raveling action of automobile traffic, Mr Pages investigations led him into a very promising theovery. He found that, when a heavy promising theovery. He found that, when a heavy resoluted with sea mixed with Portiand cement poste it cuttiets disappeared in the nixture, and, furthermore, did not separate from the other ingredients after the cement had become hard. The possibilities of off cement inhitures for water-product purposes were recognized and extensive laboratory tests were humediately begun to determine the physical properties of generate and mortar containing various quantities of oil

Many valuable data have been obtained from these investigations. The damp-proofing properties of concrete instruces containing oil have been demonstrated very definitely by aboratory and by service tests, which establish this material as one of great merit for certain types of concrete construction. It has also been shown that the admixture of oil is not detrimental to the tendle strength of mortar composed of one part of concile and three parts of sand, when the oil added does not exceed ten per cent of the weight of the cement most. The comprehensive strength of mortar and of concrete staters slightly with the addition of oil, although when ten per pent of oil is added the decrease in strength is not serious. Concrete mixed with oil resemble

quires a period of time about 50 per cent longer to set hard than does plain concrete, but the lucrease in strength is nearly as rapid in the oli-mixed material as in the plain concrete. Concrete and mortar containing oil admixtures are almost perfectly non-aborient of water, and so they are excellent materials to use in damp-proof construction. Those pressure, oil-mixed mortar is very efficient in resisting the permeation of water. Laboratory tests show that oil-mixed concrete is just as tough and stiff as plain concrete, and furthermor its cleatic behavior within working limits of stress is identical with that of plain concrete. The bond or grip of oil concrets to steel reinforcement is much decreased when plain bars are used. Deformed bars, however, and wire mean or expanded metal will reinforce this material with practically the same efficiency as in ordinary concrete.

### Detecting Icebergs and Land at Sea

I Na discourse delivered at the Royal Institution after the "Titanic" went down, Prof. Howard T. Barnes, of MeGill University, described some recent experiments with the microthermometer in the detection of levelorgs.

In studying the effect of see on the temperature of the Nt. Lawrence River, he found that the ordinary thermometer was uncleas, and that only through the use of exceedingly delicate electrical instruments can temperature changes be observed. To test the influence of an inceberg on the water temperature he devised a practical form of electrical resistance thermometer, capable of recording thousandths of a degree of temperature, and called a microthermometer. The thermometer coil is composed of a large size iron wire, slik covered, wound between concentric cylinders of copper. The connecting wires pass from a cable to the observing room, where a recorder gives the temperature curve and variation on a chart. The relay gaivenments in 6 special design, to be independent of vibration, and is exceedingly strong and quite portable.

This instrument was successfully tested in Hudson's Bay in 1910. It was found that as the ship (a Canadian government hydrographic survey boat) drew near a berg, a rise of temperature took place first, followed by a rapid fail. The offect was clearly above on the microthermometer, but would have been missed entirely on an ordinary thermometer. Prof. Barroe calls this peculiar rise and fail of the temperature "the isoeberg effect." It seems to be characteristic and enally distinguished from the small oscillations of temperature to the open seem. The rise is caused by the floating of fresh water from the berg, which water starts colder than the sea and gradually becomes warmer as the distance from the lerg increases. At the fringe of this fresh water the temperature is actually higher than the sea temperature, owing to the absorption of the sun's least. In the open sea, the warming of the sea by the sun is offset by the vertical circulation, but in the fresh and lighter water this is immostible.

in the fresh and lighter water thus is unpossions. During a trip from Hellist to Bristol, Prof. Barnes obtained a record of the sea temperature across the Allantic. His instrument was placed in the circulating water drawn in by the pump. The feeberg effect was obtained even in the water drawn from a depth of sixteen feet below the surface.

One of the most interesting results obtained with the microthermometer was the effect of land on the temperature of the sea. Whenever a ressel salls in toward the coast line the temperature is found to fall one or two degrees.

In peasing over the great walls separating the shallows water about 400 miles west of the Irish 86a, Prof. Plarace found that the temperature rose sharply to a peak 1½ degrees warmer than the surrounding sea, and insmediately feel again, a phenomenon possibly due to the presence of a vertical current of warm water stong this wall.

A solution of the keebry problem seems near at hand, but the greater value of a means of locating land camnot be ovarioused. An exceedingly sensitive safe-weeker,
and the provided of the conflicting experiences of North Atlantic sea capatina salone toutify to the undersmometer, is essential. The conflicting experiences of North Atlantic sea capatina salone toutify to the undersness of individual observations. Prof. Barnes points out that it is to a knowledge of the rate and characterisistics of the temperature variation in the sea, rather than to the secund temperature itsafet, the we mindlook for means by which the safety of mayingtons may be increased.

Sold for the state of the state

### Correspondence

(Phe allibra are not re 107 Incompany 100 Anon Anon Madeiro ede da the corres ne countries be considered, but the name is will be withhold sthen so desired.]

### Dr. Wiley Definels the Bureau of Chemistry

To the Editor of the SCENTIFIC AMERICAN:

I was supprised, and I must my indignant, at the tenor of your editorial of March 50th, 121f, in which you spoke in miss a disperseding way of the young men and women who have been my amininate in the Bureau of Chemistry.

in spik a dispersight way of the young men and women who have been my assistants in the Bureau of Chemistry. As far as I am personally concerned, I never take unbrange as any kind di criticians say more than I become interiorance with words of preise. No one realizes more beenly than I my own shortcomings and inefficiencies. I have one connotation, however, in this, that so far as I can recell, in all of the errors I may have made, I never here made one to the determinent of a consumer.

The appearsion on his ability and character of my assistants, derivers, I do not think should pass without a word of protest. Every person in the Bureau of Chemistry, with two minor exceptions, has received his appointment where a rigid emandantion by the Civil Service Commission. The total number of chemists employed in the Bureau of Chemistry at the time I resigned my position as chief was 189, of whom 100 wave employed in Washing-ingein and 85 in the laboratories outside of Washington. Of shis number 187 were graduates of colleges or universities. The 187 together hold 286 degrees. There are were a a \*14 ff 20 n A. 14 MA. 26 Ph.D., 12 M.D.,

Of shis number 187 were graduates of colleges or universities. The 187 together hold 288 degrees. There are 123 B.S., 41 M.S., 39 B.A., 16 M.A., 26 Ph.D., 12 M.D., and 21 holding other degrees, making; attogether 286 degrees held by 187 graduates.

These degrees are from colleges and universities if all parts of this country and in Europe. There are two from Boston University, two from Brooting Polyschmin Lustituse, five from the University of California, four Institute, five from the University of California, four from Clark University, three from the Clacidanai Uni-versity, nine from Columbia, fourteen from Cornell, twesty-nine from George Washington, eight from Har-vard, fifteen from the University of Illinois, two from Johns Hopkins, there from the University of Kanasa, four from the Kentocky State University, seven from the Maryland Agricultural College, two from Massachusetts Agricultural College, thirteen from the Massachusetts Agricultural College, thirteen from the Massachusetts. Institute of Technology, twelve from the University of Michigan, three from the Agricultural College of Michigan, two from the University of Minnesone, thirteen from the University of Ohio, three from the Agricultural College of Okidahoma, two from Pennsylvania State College, ten from the University of Pennsylvania, six from Purdus University, four from Princeston, two from Stanford, three from Tults, nine from the Vingitia Polysconford, three from Tults, nine from the Vingitia Polysconford. tord, caree from Turts, nine from use virginia and rolyscen-nic, two from the University of Virginia, aix from Wis-consin, ten from the Worcester Polyscohnic, elevan from Yale, one from the University of Halle, one from the Uni-versity of Erlangen, two from the University of Göttinod three from the University of Heidelberg

In addition to these, the Inspectors of the Bureau, are not expected to be college men, are largely the hold-Of the forty inspectors, twenty-

ers of college degrees. Of the neven are graduates of colleges.

order that you may have an accurate idea of the re of the examinations passed by the chemists entersmearce or size examinations passed by the chamitate after-ing the Bureau, I addressed a letter of inquiry to Com-missioner Black of the Civil Service Commission, and isclose a copy thereof and of his reply. It shows the fundamental training received by the men of the Bureau of Chemistry, and the conditions under which they en-

In regard to the training in the Bureau itself and the work done, I would say that to a large extent, the field of food and drug ohemistry being comparatively new and so extensive, we developed, in a way, a training school for food chemists, and our chief difficulty in maintaining the iency of the Bureau was that the work of the men emeacony or the nursua was that the work or the men was so valuable and so widely known, that they were con-tinually taken away from us by commercial firms, who paid larger salisties than we could in the Government. This can hardly be considered an argument against the This can hardly be considered an argument sgainst the efficiency and training of the men ongaged in the work, inasmuch as no one will contend that commercial inter-cels are in the habit of employing, at high salaries, men who are not expert in their specific lines. I doubt it you can find a more capable, more devoted, and more loyal body of college graduates, of the same number, saywhere in the United States. I find certain

that you must have made the statements you did under a misapprehension of the facts, and I sincerely hope that a misapprehension of the facts, and I mnowny more way you will take operation to correct the impression which your editorial has undoubtedly made.

Washington, D. C.

H. W. WILEY.

BARLE CONTRACTOR TO T

Dr. Wisey mistakes an academic degree for scientific siliciancy. Whether or not the employees of the Eureau of Chemistry peaced Civil Service comminations or generated from institutions of learning is bested the int. We are concerned only with the effective adge of which Dr. Wiley performed a conspicuous

Dr. Wildy states that so far as he can recall he never made a decision to the detriment of a consumer. We would refresh his memory by citing a decision of his which was published fully in the Washington Post, and which permitted the use of lead in baking powder. Lead is a poison cumulative in its effect. Surely this

and wrong permittee the use of read in basing powder. Lead is a poison cumulative in its effect. Surely this was not in the interest of the consumer.

The mere existence of the Referee Board, appointed by President Roosevelt and composed of men of the highest reionitifie standing, speak for itself. That board was created for the sole purpose of checking up the work of the Bureau of Chemistry. It has cost this country hundreds of thousands of dollars. To be sure, the idea has been spread abroad that the Referee Board is the tool of food and drug adulterators; that its existence is a menace to the public. On questions of scientific fact, such mon as its chairman, Dr. Ira Remsen, are not easily fooled. Nor may one secuse them of corruption without impinity and without incurring a justified indignant protest from every scientific man. So long as the Referee Board is required to continue its critical examination of the Bureau of Chemistry's doings, so long must the Bureau of Chemistry's continue, see scientifically unfit for the task of prosecuting food adulterators. adulterators.

As an example of the inefficiency of the Bureau of Chemistry we have only to cite the benzoate of soda idies. The important question of the effect of sodium uscate was intrusted to a medical student who had not even a degree of M.D. Totally inexperienced, totally unfit for this important task, is it any wonder that his results were repudiated by such experienced and respected scientists as Lehmann, the distinguished hygienic authority of Würzburg University? Is it any wonder that President Roosevelt found it necessary to appoint a board which would conduct investigations with scientific accuracy to determine the effect of benzoate of soda? And is it any wonder that the findings of an in-competent medical student should have been reversed?

The Pure Food and Drugs Act is one of the most important pieces of legislation ever passed in this country. That it should be administered by men whose scientific incompetence is a matter of common knowledge is unfortunate for the consumers whom Dr. Wiley states he has always sought to protect.—EDITOR.]

#### The Scientific Feet of the Bureau of Chemistry

To the Editor of the SCIENTIFIC AMERICAN: I was interested in reading in your August 3d issue an editorial with the caption "Wanted--A Chief for

ne Bureau of Chemistry."

The article reads, in part: "Months have elapsed since Dr. Wiley resigned as chief of the Bureau mistry. That no successor has as yet pointed may be attributed to the fact that it is no easy task to induce a scientist of commanding posi-tion and personality to accept an annual salary far less than the sum which he could earn in a year in private practice. Moreover, the conditions under which now carried on in the Bureau of Chemistry

Your statement that it is no easy task, etc. is absolutely correct, and it is on this account that the Referee Board was established—a Board composed of scientific experts whose qualifications were such that any investigations conducted by the Board would be recog-nized in the scientific world as well and faithfully

would be intolerable to any really scientific man.

reference to the conditions existing in the Bureau of Chemistry, I beg to say that there is less friction there now than there has been for some time, as the work is being done harmoniously.

You say, "Selfish manufacturers are bound to do all in their power to make his official life as unbournible as possible, and the spirits that now dominate the work done by the Bureau of Chemistry in passing upon the legality or illegality of the doings of the food and drug would hardly be in sympathy with a

In reference to the above assertion I beg to say that in reservance to the shows a secretion to set to say that it is the manufacturers who are desirous of having experiments conducted by a truly scientific board. You also say in part "As matters now stand, the Bureau of Chemistry has the lamentable distinction

of being the only department of the Government that mot stand on its own scientific feet, and that re-

quires scientific supervision by another body."

In reference to the above, I beg to say that the Bureau of Chemistry never had any "scientific feet to stand on

You also say. "At present wealthy dishonest food anufacturers find it no difficult task to escape the infahment they so richly deserve. Opposed by well saning but incompetent employees of the Bureau of Chemistry, they find it no difficult matter in court to offset their unscientific evidence by expert testimony, which can be bought at a market price, and which is at least as good as the evidence offered by the Govern

In reference to the above statement, I beg to say that the judgments secured against various so-called "wealthy dishonest food manufacturers," up to August 9d 1912 numbered 1 550

Wiley, in his report on the Committee of Expenditures in the Department of Agriculture, 1910, when he was asked by the chairman, difficulty in keeping bright young men in the department at the present time?" said: "That is the great difficulty. As soon as a young man becomes noted for his work he is in great demand, not only in other bureaus and other branches of the public service, but but east and other other so the paint section work outside. I think the Bureau of Chemistry has lost a larger percentage of its good men than almost any other Bureau in the department. We are losing them constantly.

constantly."
If was disclosed, during the Coca-cola case, that Dr.
Wisey refused to testify, saying he "could not qualify as a chemist, a pharmacologist, a toxicologist, a physiologist, a physiological chemist, or a doctor of medicine either to his own satisfaction or to the satisfac-tion of the Government"

The above clearly demonstrates that the so-called chief of the Bureau of Chemistry could not qualify as a chemist, and that he was unable to retain good men in his employ, consequently, when truly scientific questions arose they were referred to a board com-posed of the best scientists obtainable in the United

The above are facts, and as the SCIENTIFIC AMERICAN is desirous of giving its readers scientific facts, I trust you will give them an opportunity to peruse the above. II. L. HARRIS New York, N. Y.

#### The Electric Niagara

To the Editor of the SCIENTIFIC AMERICAN:

The issue of June 29th discusses the "Electric Niagara" France. It occurred to me when reading this article that the French may explain their procedure in such experiments as those performed by Sir J. J. Thomson and others on the effect of potential on cloud formation. Vapor seems to have a tendency to congeal if there are small particles present which form a nucleus. sman particles present which form a nucleus. Such nuclei result in diminution of vapor tension and conse-quent cloud formation. Electric charges seem to form nuclei or accelerate cloud formation, but to my recollection the condition is a critical one

Rain drops and hail stones require nuclei; and perhaps the French preventive methods, while they are not large enough to handle all the electropty that nature stores, may be supposed to make enough trouble to pre-vent the critical condition and thus prevent the formstion of the starting nuclei. Cleveland, O.

It is quite true that free electrons, however produced, serve, under certain conditions, as nuclei about which water vapor may condense into droplets, but the condi-tions are so unusual that it seems impossible for them to take place in the open atmosphere. Even the negative electron, which is a much more effective nucleus for condensation of water vapor than is the positive electron, requires (a) that the air be free from all dust, and (b) that the water vapor present shall produce at least a four-fold supersaturation. But as dust, according to innu-merable observations, is always present in the atmosphere, it follows that supersaturation is impossible in the open, and therefore that no amount of ionization can materially affect either the time or amount of rainfall, hall, snow or any other form of precipitation.

From experiments and observations begun by Simpson in India, and continued by others in various countries, it is practically certain that the electricity of thunder storms, whether accompanied by hall or otherwise, is only a by-product of the storm itself and in no sense its cause. Hence to modify it either in kind or amount would be to modify only one of the things which the storm produces and not that which produces the storm. - Epiron.

#### When the Poles Attract Each Other

the Editor of the SCIENTIFIC AMERICAN:

C. C. Kiplinger, in the issue of March 16th, eites appriments to prove "like poles attract each other." unfortunately, it seems as though such things as "magnetic rounds" and other luxuries have ousled the old "Filings" experiments from the board. Had he tested range experiments from the tone. I am ne ested with filings he would have found the true cause, which is a very old phenomonon, that of local "roversal of polarity." the larger magnet causing a temporary reversal in the end of the smaller, which then acts as a piece of plain iron or steel. If a steel magnet be as a piece of plain iron or steel. If a steel magnet be used, and then tested, after separation, by filings, it will be found that "consequent poles" have been pro-duced. With the electro-magnet these disappear im-mediately on separation. I would like to know what he means by "similarity of magnetic and pressure phenomena."

Hat McKaill.

Kalsan River, West Australia.

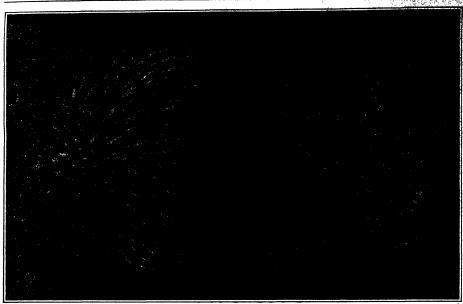


Fig. 1.-Plan view of the field of force between the two poles of a magnet.

### Making Models of the Magnetic Field

Fixing the Iron Filings With Plaster of Paris

By Nathan C. Johnson

To HE mapping of the magnetic field of force by means of from Blings sprinkled over a glass plate, beneath which is a magnet, is a very old experiment. Faraday was perhaps the first to perform it; and his sketch of the field of force between two parallel conductors as revealed in this way is the earliest record we have of this phenomenon.

Since then, however, the experiment has been performed times without number; but its userfutness has been limited by reason of the developence of the filings with the loss of their form as soon as the exciting force was removed, or any numeral conditions of mechanical shock were introduced. Further, only a two-dimension map of the field of force was produced; and although it was known very soon that under normal conditions the field was of equal intensity on all sides of a central line through the poles, yet we have hereofore lacked more than translend coulir proof of this fact.

With a view to overcoming these difficulties and of determining both the form and the intendity of the field under varying conditions of point form in such manner that the results could be studied at lelsure, the experiment herein deserthed was devised. Briefly, it condsts in using a mixture of Iron fillings and plass ter of Parls made into a paste with water and sifting this paste over the field area through a medium-mesh sieve. As the Iron is carried in suspendon in the paste, the mixture is attracted by the poles and the intervening stressed space in proportion to the masnetic intendity, with the result that when the mixture has bardened, due to the setting of the plaster, a relief map, or a three-dimension model of the field of force, is obtained. Photographs of models made in this manner are shown horewith.

Fig. 1 shows a three-dimension map of the field of

Fig. 1 shows a three-dimension map of the field of force between the poles of a powerful electromagnet. The magnet had square poles, but the effect of this form is not noticeable, due to the intensity of the field employed in making this map, the procedure outlined above was followed, a glass plate being placed over the poles of the magnet and the paste of platest and ivan being effect over the plate through a steve As before explained, the paste is attracted away from the angunetic flux; and the more intense the field in any locality, the greater the quantity of material at that portion in the resultant map. Therefore, the elevations of the different portions show approximately the intensity of the force at that point; and the direction and inclination of the spines or points rising from the surface also indicate the form and direction of the all lines which were not intense enough beyond a short distance from the pole to hold the material in suspension. In Fig. 2 is shown a profile view of this map, which makes the relief feature more distinct.

Of course the work of applying the paste has to be that were quickly; and the paste must be of just the right competition and consistency to secure good results. Repeated fullures are almost sure to be the prive of the first success; but once the knack is learned, the procedure will be found easy and the results very instructive. If should also be added that an addittional value of the distinctness and the value of the front property of t

Fig 3 shows the field of force of a short solenoid without a core. The making of this model was a very difficult piece of work, due both to the difficulty of obtaining a field intense enough to form the paste properly without undue heating of the coil, and to the necessity of sawing the coil in half afterward without injury to the finer spines of the model. It is to be regretted that some of these have been lost, but enough remain to show the field well. The author hopes in the near future to carry out this work further and to investigate by this same means the leakage in solenoids and the field of force when using different forms of

By various methods we have long ago determined the effect of various shapes of pole pickes on the attractive power of magnets. Perhaps the first important researches in this expard were made by Dr. Juitus Dub in 1850, an account of which is given in his book "Elektromagnetismus." His method of procedure was to have pole picces of various forms and dimensions which could be screwed upon the core of an electro-



Fig. 2.—Profile of the field of force between the two poles of a magnet.

tive power of the difficulty desired in the contract of a magnitude of a station of a station of the contract ing the date Singless and Count to Magon also investigated descenses, siding to the investigations and con-in of Dub a sesserot on the lesitage of flux with figerat pile pieces. At Shout the same time, Von investigated flux distribution over different Solke investigated that distribution over different polar firms, and by using a small seel that it suspended from a spring belance, he measured the pull on the bell over different portions of the point area. The results of these pioneses have since been substantially confirmed by their livestigators, using more refined methods; but it may be interesting for us to prove these results visually by means of the platter and the

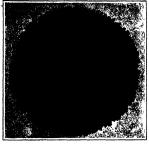
Fig. 4 shows the field of force over a large flat pole piece. The directions of the lines of force are very well shown in this model, as well as the intensity of the force, showing the great energy at the edges and the relatively small intensity at the center of the pole, the telestreely small incessiny at the center of the pois-flig is also would expect, for from the edges, the liber have a shorter path back to the opposite pole than they have from the center, so that there is greater magnetic density at the edges. A curtous optical little-sion may also be observed in connection with this photograph. If it is turned upside-down, the perspec-tion of the objection of the connection from that tive of the photograph appears far different from that of the preper position.

Fig. 5 shows the effect of a small flat pole having an air return. By this latter is meant that the opposite pole of the magnet is a considerable distance away, and that the magnetic circuit is completed through the air, with no nearby iron return circuit to build up the intensity of the field. We see from this model that with such a nois, there is a considerable concentration of the force lines at the edge, with resultant spread ing. Compared with the intensity of the center of the pole, as evidenced by the length of the spines, the intensity at the sides is much greater.

shows an exaggerated case of the same kind. In this, the pole face is twice the diameter of that in the preceding, and we have a corresponding increase in concentration at the edges as evidenced by the radia-tion, and a very noticeable diminution of intensity at It should be understood that in making



Fig. 3.-Field of force of short sciencid without core.



Pig. 4. -Formation over large, flat pole piece.

itself. After hardening somewhat, it was split open to show the interior structure, which should give us the force distribution over the polar face, as well as the field intensity and form. That this result has been accomplished is evident from inspection. It is not one seen that the conical pole has the greater concentration of the two, with extreme density of flux from the point; while the rounded pole shows less co

centration of the conical pole. The bending over of the lines of force emanating from the flat pole can be very clearly seen in this figure.

Fig. 11 shows the enlarged flat pole as contrasted ith the conical pole. This model became too hard to with the conicul pole. split down the middle, but the interior is hollow for spint down the mode, out the interior is nonzor to u third of the length from the flat pole, except at the edges, where the material is very dense and converges sharply toward the center. As the quantity of from in this model is considerable, the lack of radiating spines from the edge of the flat pole may be accounted for by the formation of a magnetic short circuit through the model.

That there are cortain defects inherent in the models, and in this method of mapping the magnetic modes, and in time method or mapping the magnetic flux, the author recognizes; but they are submitted in the hope that by their use some information may be gained that may eventually lead to a botter understand-ing of some at present puzzling phenomena

#### Insects and Formol

I T is a matter of some surprise that insects can live in such a powerful antiseptic liquid as formol, which is much used in keeping anatomical preparations pre-cisely because it kills the tissues rapidly. A German scientist, M. Schultze, states that files of the Drosophila genus resist the action of formol in a striking way, and he observes other remarkable cases, for instance hydrocyanic (prussic) acid vapors are exceedingly poisonous and will kill moths at once, but he finds that the zygenes are able to live in it, and even to develop. Jensen states that although the liquid in the pitchers of the nepenthe plant attacks and digests insects, he finds that three culicides will live in it unharmed, and they are protected against the digestive action by an antiare protected against the digestive action by an anti-fermeet which they secrete. Prof. Korschelt saw that larvae of the common fly, when kept in a 2 per cent solution of chromic acid, could be transformed into pupe and also into winged files. Another German scientist, Prof. Schultze, received bottles from cust Africa containing anatomical specimens preserved in formol, and he found a great number of larve and purse of the Drosophila rubiostrata. Fearing that they would attack the specimens, he poured in pure formol, but even this did not kill them. Other Drosophila are found to live in liquids which seem unfavorable for



Fig. 5. -- Small flat pole with air return.



Fig. 6. - Enlarged flat pole with air



ded pole face with air



return.

these models, the same procedure was followed as in making Fig. 1; so that they virtually have made themseives, only so much of the material as we picked up by the pole itself being in the model. For this reas their form may be considered a reasonably accurate

representation of the magnetic field. In Fig. 7 is shown a rounded pole face of small diameter. It will be seen that this has great intensity at the center and less at the sides, with only a slight

tendency to radiate out-wardly from the sides. This corresponds closely with what we know in re gard to the effect of roundended poles for electro-

Fig. 8 shows a pole, having, as before, an air return. The extreme concentration of this form of pole is well shown by the length of the center spines and the close bunching of the whole mass around the

To confirm the last two ults and to contrast them with each other, as well as to show the form of an in-tense field between two such poles, let us refer to Fig. 9. This model was formed in the same manner as were all the others, so that it, too, may be said to have built

tration at the middle and a greater tendency to radiate In Fig. 10 the contrast between the poles is still

more marked. In this case we have a small flat and a conical pole, the model having been split open as before. It will be noticed that the structure is less

dense in the center than was that formed by the rounded pole, while the tendency to radiate from the edges is greater, especially so in contrast to the con

development of life for instance the Dr. functors and others are found wherever there are substances in acid fermentation, such as in fruits, vinegar or beer They lay their eggs here, and the larve find sufficient food, this consisting of spores, bacteria and fermented matter which appear at the surface of fermenting liquids. The Dr accti lives in apples or apricots which are in putrefaction, and the Dr palispes lives in the larva state in the sap which flows from cut places in

the elm tree Other unusual cases might be mentioned



Fig. 9. and conical pole pieces.



Fig. 10.—Field between small flat and conical pole pieces.

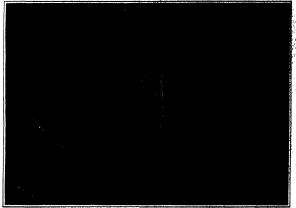


Fig. 11.-Field between enlarged

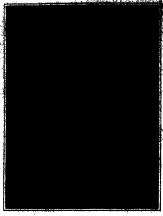
#### A Motor-driven "Mauretania"

ASING its estimate on Basing as a fuel required by the "Sciandia" of 2.500 horse-power, and assuming a consumption of 11½ tons of oll per day, the Engineer estimates that the Mauretania" would require 313 tons of fuel per day, or 1,487 tons for a run across the Atlantic It is estimated that if the "Mauretania" had a double buil, with one had a double hull, with one foot between the two skins, she would have storage space in her sides of about 56,240 cubic feet, which would be sufficient to con-tain the oil necessary to carry her across the Atlantic.

### SCIENTIFIC AMERICAN



Front of the Broadway Beach tunnel building at Lower part of cutting ring at the right. The dotte shows the contour and location of the concealed left p



Side of the shield.

Excavating the Beach Shield

Dof August last of lower Broadway under the supervision of the Public Serv ice Commission of New York city for the building of the new Broadway and Lexington Avenue four-track subway, the engineers had to remove the smaller tunnel, 10 feet exterior diameter, built in 1869, located under the center of Broadway, opposite City Hall Park, and extending from the south side of Murray Street to the southwest corner of Warren Street. on the north

This tunnel had been constructed under the street at that early period without disturbing the surface or the traffic over hand as described in the SCENTIFIC AMERICAN of Murch 5th, 1870, by means of the Beach by draulically propelled cyl indrical shaped shield, built of wood and iron, the exterior diameter of which was of the same dimensions as the trailing tunnel of tube, or about 10 feet

It was the invention of Mr. Alfred E. Beach, one of the original proprietors and editors of the Scientific American. Upon the request of Mr. Alfred E. Beach's son, Mr. Frederick C. Beach, now also one of the owners of the SCIENTIFIC AMERICAN, and the courtest of the officials of the Public Service Commission, the contract-ing company was asked to refrain from demolishing the shield after it was dug out, with a view of its removal, preservation and restoration as a historical relic, it being the first machine of its kind to operate in tunnel construction work in New York city and the forerunner of all the great shields used in the construction of the mammoth electric railway tubes now under the rivers about this great city.

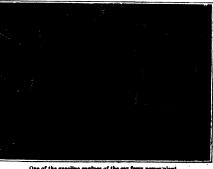
An inspection of the shield from the or inspection of the smeat from the exterior as it by parity imbedded in the sund, by Mr. F. C. Beach (who actively supervised the operation of it in 1809), disclosed the fact that in all these 43 years the iron and brass work, in-cluding the thin hood of iron on the rear, had remained in pacity good condition, but the wood staves between the front cutting ring and rear ring carrying the hydraulic rams and the cross front wood shelves had entirely disappeared and rotted away. The flashlight photograph, with Mr Beach standing near the cutting edge, shows the one half of the front cutting ring with projections on its in terior surface, to which was secured by holts the ends of the thick transverse holts the ends of the thick fransverse shelves for the purpose of preventing the inflow of loose sand. In the center, is observed the timbers used by the contractors to support the present street plank-ing over head as well as the electric street



A full side view of the all-steel interurban car ferry "Henderson."



This car ferry has a capacity of two electric pa speed of 8 miles per hour, and is operated by g



One of the graphine engines of the our ferry newer plant.

railway. The side view shows the side of the front cutting ring connected by inch stay rods to the rear of the hood-ram sup-porting ring, and between these rods at, equal distances will be observed the cylinends of the hydraulic rams with be tubing on the rear, which connected with the main supply pipes from the hydrastic pump. This was operated by manual power. The long thin cylindrical hood is attached to the rear piston ring and extends back from it some two feet or more tends sack from it some two feet or more. The pistons within the rams are forced out by water pressure against the completed tunnel, built up within the hood, pushing the shield forward through the sand to the extent of the hood; then a new layer of masoury is built and the ess repeated. By this method only quantity of earth is removed that is required for the tunnel to occupy

#### Car Ferry Service Acress the Ohio River

Apractice which has been worked out at Henderson, Ky., demonstrates the efficiency of gasoline power for use on car ferry work

The "Henderson" is the first interurban car ferry ever built, and the first large car ferry operated by gasoline power. She is all steel; length over all, 120 feet; beam over all, 341/4 feet; beam at water line, 25 feet. Her displacement when light is 88 tons, and loaded with two electric interurban cars, 150 tons.

Her power plant is two 54 horse-power "Buffalo" heavy duty gasoline engines, seven-inch bore and nine-inch stroke, with normal speed of 350 revolutions per a normal speed of 500 revolutions per minute. Each engine drives one side pad-dle wheel, but there is additional gearing by which one engine can operate both wheels if desired. The motors drive the wheel shafts through large bevel gears at a ratio of 10 to 1. The side paddle who are 10 feet in diameter, three feet wide and have 20 blades 18 inches deep.

Economy was one reason why gasoline power was chosen for use on the "Henderon." While it takes her only six minutes to cross the Ohio River with the current, and an additional two minutes when go-ing against the current, the "Henderson" is called upon to make only one round trip every hour. This means that most of the every hour. This means that more side of time sue is standing idle at one side of the river or the other, waiting for her care to arrive. With a steam plant this would mean a great waste, for oad would be consumed all the time the boat was at dock, but with gasoline engines, when the boat stops, the cost stops, there is no steam to keep up.

The Marks

ed of a three-ber siste-harp, of which in had been accidentally broken, it it might be arranged to be played

that establish was to have plotters for the as in a require hard but this scheme was sed, as too couplicated, an arrangement for blown upon the airfugs, being manufactured. upon the strings, being substituted. s showed that the simplest plan was solemoids, that is, magnet colls with movable iron Mow this was managed and the apparatus conshow has were managed and the apparatus con-sisted, is abown in the accompanying illustrations. Ipon the harp A (Fig. 1) were sciewed two up-th, side phoese B and B' with foot places C and C'support the instrument in inverted position for play-



The electric harp in operation. A solenoid she

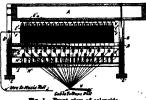
ing. Three strips, D, G, and I, of %th stuff, 1½ inch e, were then cut out. The strip D was laid across the 21 strings of the harp, between the two uprights d carefully marked where the strings crossed it These marks were extended to the 11/2-inch side, cros ing two parallel lines drawn lengthwise on the strip, % an inch spart. A light mark was then made in the ood, with a center punch, at alternate points wh the cross lines joined the parallel lines, "staggering" them, as it is called At each mark, a 3/16-inch hole was then drilled perpendicularly through the wood. using a twist drill

The solenoid coils were now wound upon 21 pieces of 3/16-inch thin glass tube, 2 inches long, the glass being nicked with a file and broken between the fingers. The winding was done thus: A bit of 1/4-inch brass rod 3 inches long was clamped in a vise, and one of the these slid upon it. A wooden crank was then forced temporarily on the glass, and the latter wound with four layers of No. 24 enameled copper wire, in a coil 134 inches long. The terminals were twisted together and the ends of the coils shellacked to prevent their slipping.

The free ends of the tubes were then set in the m in the wooden strip D, and glued securely, after which the strip was secured between the uprights, in such a position, that the ends of the solenoid tubes E', E', etc., were one half inch from the harp strings, which show in the figure as a row of dots. One terminal of each coil was then scraped free of enamel and soldered to a common return wire F, ter-minating in a screw and washer on one of the side r a battery connection.

The strip G was then screwed between the uprights, the strip is was taen acrewed between its appraint.

close to, and at right angles with the strip D. It was
drilled to receive 21 round head No. 6 brans screws,
one inch long, provided with washers. The screws were
set in opposite sides of the strip, alternately, similar



-Front view of solen-

to the selencids. The iron cores for the magnets were made from 8-inch wire nails of a size to just slip easily were first set in place in the tubes, as shown at  $H^1$ ,  $H^2$ , , and the strip I upon which they were to rest, was zeed between the supports. 2 inches below the strip D, so that 1/2 inch of the core remained in the tubes. The upper face of the strip I was padded with a four-feld thickness of canton flames, to reduce the noise of the dropping cores. A similar strip of finnel (V)

the dropping cores. A similar sump of manner (\*) was glead to the face of the harp, opposite the solenoids, to cut down the reverberation of the strings. The keyboard and music roll attachment, shown in Fig. 8, consisted of a base board J, 13 inches long with upright sides K, K', 5 inches high. The rollers, L, L', re made of 12-inch lengths of 2-inch curtain pole with 24-inch heads M, M', etc., turned from cigar box wood. They were pivotted at one end, on wire nails, driven into the co driven into the centers; and revolving in holes drilled in the side piece. In the other ends were forced 2-inch in the since piece. In the other ends were forced 2-inch cranks of 3/f-black round brass rod N, N, revolving in open slots in the side piece to allow the rollers to be easily removed. The slots were covered with small brass strips which could be turned saide to release the

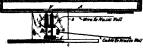


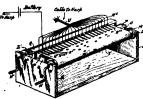
Fig. 2.-End view of sole

rolls. A cross strip, marked O, was fastened to the top of the side piaces, just back of the front roller, and to this was secured a strip (P) of 1/16-inch brass 3/8sch wide provided at one end with a screw and washer

for the lattery connection.

Half an inch back of strip O was placed a second cross-piece Q, of the same size as the former, but raised 1/2 inch above it, on small blocks. One end of strip Q was hinged to the block and the other held down by the was angest to the speck and the other held down by the latch B. To the narrow edge of this strip were screwed 22 strips of light spring brass R. R. etc., 1½ inches loug and tapering from ½ inch wide at the large end to 1/16 inch at the small end. The strips were champed together in a vise, and drilled through the wide end in together in a vise, and urines through the ware en. ...
one operation with a hole large enough to take a No. 6
screw. The extreme tips of the narrow end were
turned up slightly to avoid entering in the music roll. and the whole set fastened by screws to the strip Q in such position that the small ends press the cross-strip P, and were spaced just 1/4 inch apart.

The paper music was made from a strip of heavy wrapping paper, about 6 feet long by 12 inches wide. One end was cut V-shaped, the point being tacked to the center of the front roller, which was then turned over a couple of times to hold the paper firmly. The paper was then wound forward under the springs, and the notes and chords marked in pencil in a line with the corresponding springs. The bar Q was then thrown back out of the way and a strip of wood, sawed across in, was set temporarily beneath the paper at this This wood was 12 inches wide and 5% inches high, and was used as a support upon which the holes were punched in the paper at each pencil mark, using a hollow steel punch of % inch diameter. The end in of the wood allowed the punch to sink in, making a clean, round hole. Perforation for successive notes were spaced ¼ inch apart. The harp and keyboard were connected with No. 24 enameled wire, as the distance between them was only about 18 inches. For a longer distance No. 18 or 20 wire would be required. A wire was connected to screw No. 1 on the cross-piece D, Fig. 1, and the other end to the screw on spring No. 1 of the keyboard. No. 2 series on the harp was joined to spring No. 2 with a second wire, and so on. The wires were then gathered into a cuble U and taped together as shown. A battery of two or three dry cells was attached, one terminal going to the screw on the non return wire F and the other to the screw on the strip P.



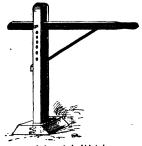
Pier. 2.—Music roll m

te the harp the crank of the front roller was turned to draw the paper forward, and as the perforaed down,into contact with the strip below, through ing the current into the correspon ding solenoids and wing up the iron cores so that they struck the ings with a clear, sharp blow, dropping instantly as

the paper was drawn forward, and the current shut off. The best average speed for the roll was found to be about two longitudinal feet per minute.

#### A Simple Vehicle Jack By James H. Armstrong

ONE of the simplest forms of jacks for use in lift-ing the bodies of wagons or other vehicles is illustrated in the accompanying drawing. The device can readily be made by any amateur and the construction is inexpeasive. The uprights of the jack consist of a single leagth of iron 1½ by ½ inch, bent double or to hairpin form, with the lower ends secured in a block of wood measuring 2 by 6 inches. The ends of the uprights are fixed into recesses in the block, and are held in place by means of boits as indicated by dotted lines in the drawing. The lever on which the vehicle

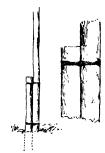


An improvised vehicle jack.

axle is supported is made of strap iron measuring 1 by % inch. This is fulcrumed between the uprights by means of a bolt which passes through holes in the sides of the uprights. There are a number of such boit holes to permit of adjusting the lever to various soft moses to permit of adjusting the even to various beights. The weight comes on the short arm of the lever and is lifted by depressing the long arm. To hold the long arm in depressed position a rod is provided which is fastened to the lever at one end, while the other end passes between the uprights and is welded to a block of metal. This is adapted to bear against the uprights and serves as a catch to hold the lever at any desired adjustment. The rod shown in the draw-ing is % inch in diameter

#### Lashing or Seizing Timbers Together By Albert F. Bishop

IMBERS from 7 to 10 inches in diameter can be bound together readily with wire about the size of A bound together readily write whom the size of that used in telegraph lines. The end of the wire is turned at right angles and fastened to the timber by a staple. The wire is then wound around the two pleess as tightly as possible from four to six turns. The end of the last turn is bent at right angles and d to the other timber by a staple. Now a small pointed har is inserted in the center of the layers and



Method of lashing timbers together.

the layers are twisted several times as shown in the sketch. The writer believes two pieces could be bound together in this manner as tightly and firmly as the use of bolts could make them. This method requires very few tools and very slight expense for materials. This wrinkle can be applied to telegraph poles, flag staffs, or repairing fence posts, etc.

### Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Healing Broken Machinery by the Electric Flame

By Joseph B. Baker

For example, the motor shells and gear boxes of electric cars may become cracked by yielding to the fatigue of the metal in the ordinary operation of the car. Cracked motor shells were formerly either sent to the scenario of the car. Cracked motor shells were formerly either sent to the scenarios of the car. Cracked motor shells were formerly either sent to the scenarios means practically throwing away an expensive steel oasting on which perhaps, a lot of valuable machine work has also been dome, and to repair the part by riveting is to fail to restore the original strength and rigidity. The same thing applies to the steel forgings of cart-truck frames, parts of printing prosess, or the part or forged parts of any good-sized machine. The need is, then, for some means of castly, quickly and inexpensively mending such broken parts.

This need is tilled in the electric are veiding process, which can be used on the appt, wherever direct electric current is available, and in a small space ton feet square. Are welding reclaims the part at an expense which is very small compared with the cost of a whole new part, a cost which does not exceed the expense of the far less effective riveting. The occurrence of a bad crack, or of an sectual break in a big, expensive easiing or forging is the opportunity of the are welder to make whole and sound again a piece which had seemed irretrievably ruined. Steed caustings cout more than iron eastings, and at pays correspondingly better to repair them by the are welder to the test of the ending process. They are just as easily healed as the latter, and it is something worth while to recover a steel casting for example costing \$500 with half a day's work at an expense of a titlic (or less) of the first cost of the presc.

By the use of a direct current of 220 volts or over all castings and forgings excopt brass, bronze or copper can be re-paired by genunely welding the break, using the arc to soften the metal advacent to the break and then feeding in a piece of metal of the same or better grade to fill in the break and make the piece integral. alternating current only is available, it may be transformed into the necessary direct current by the customary apparatus for this purpose, such as the mercury are rectifier for relatively small work. The process is simple and rapid, but certain precautions are necessary. The operator's only tool is the earbon electrode in its holder, a hand tool with means for protecting the operator's hand and body from the heat of the arc. The head and body are protected by a canvas hood, and the eyes by goggles having several thicknesses of colored glass. The earlier pencil, ½ inch to I inch in diameter, according to the size and shape of the work, is made the negative electrode, and the voltage is cut do to about 100 volts at the arc by a suitable adjustable resistance.

When the piece is once set and aligned,

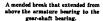
When the piece is once set and aligned, and the current turned on, the work pro-





Mending a broken gear: a difficult job of are welding. The gear teeth at the break were saved. The alignment had to be maintained exactly during the welding.







The arc welder at work on a railway motor shell. In practice the arc used is somewhat shorter than in the illustration.

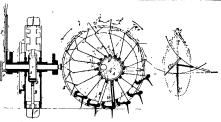


Fig. 1.—Front and side views of traction wheel with retractable blades.

Fig. 2.—Paths of fixed and retractable blades.



The new traction wheel driving a plow through an alfalfa Seld.



Plowing a rice field; a supreme test for the traction wheel,

ceeds with marveious rapidity. The searching and penetrating heat of the age early softens motal chain of the ordinary thickness found in the structural eastings of machinery or in the main or misery moving parts of the same, up to 4 inches; the 14-inch to 54-inch thickness of a motor shell is quickly brought up to welding temperature necessary for a true union of the parts. If overheated by the intense play of the arc the metal runs like wax, and here, is where skill and special manipulation of the powerful tool is required.

the powerful tool is required.

It is better of course to apply the walding process to pieces when they are first found to be erasked, or to have a creak starting, from some habitual or repeated starting, from some habitual or repeated stress or an accidental shock, and before they become broken away entirely: "a stitch in time saves nine." In some cases there is opportunity to make the work even better than new by walding upon it "trengthening or reinforcing parts.

#### A Novel Italian Traction System

MOTOR - DRIVEN agricultural material of a slippery nature. In order to give the driving wheels an adequate purchase on the ground they must be made very heavy and must be provided with cleats. This adds a material load for the angines to drive and is entirely unnecessary in the opinion of two Italian inventors who have deviced the traction wheel illustrated in the accompanying engraving. In place of eleats the traction wheel illustrated in the accompanying engraving. In place of eleats the traction wheel is provided with long blades, designed to dig into the ground. Whenever desired the operator may retract these blades in the machine continuous ending the continuous endinous endinous

When it is desired to run the traction wheel without proposting the blackes into the ground, they may be moved to a different position by operating the lower F, so as to throw the escentire A to the position by operating the lever F, so as to throw the escentire A to the position aboven by dotted lines in Fig. 1. Then the blackes will proper hard to upper half of blackes will proper from the upper half of blackes will proper have the position of the lower half where the best owner in the lower half where the head owner in the lower half where the head of the accompanying illustrations is a photograph of the machine operating through a rice field. Here it is put to an extreme test for the reason that the field is flooded with water, and affords very little purchase for a traction wheel Another plotture above a plow quipped with a traction wheel of the new type, operating in an alfalf field. The new type of traction wheel affords an ideal hold on the ground and permits of reducing materially the weight of agricultural machinery. Furthermors, the ability to regress

A CONTRACTOR OF THE PROPERTY O

dwith to which the blades will sink d and to rett desired, is a very important ad-

### e-mark as a Busin By W. E. Woodward

1918, by Muse & Or NR average busi HEE average business man has only the A- vaguest notion of the value of a trade-erk. He does not realize that it is very on the connecting link between the pro-cor and the ultimate consumer; that it symbol of good will, a tempthe asset with determinable money value; that it must sheeth and applied not in a haphasard but with a due regard for its psychologi-affect upon the public. Nor does he the importance of complying with ititing requirements which secure to property right in a trade-mark comstatistany requ ble with the property right that an star acquires by taking out a patent.

implier acquires by taking out a patent, manifoldowing as the last of a series of the parties of a man who is at once pade-mark, an advertising, and a busi-ies expert, a man who has a first hand outledge of the value of trade-marks and the correct methods of trade-mark exploitan. The series, which will be eventually blished in book form, included dis-scions, written in business English, of analyses of the on, the element trad ral trade-mark law, analy ente for registra el trade mark. and trade-mark pro

#### Am Ingenious Similarity of a Trade-mark

--IX. led from page 18h, August \$1sl., 1918.)

An infringing mark may be so nearly well-known and valuable trade-mark that the unwary or careless may be deseived, yet, at the same time, it may be so dissimilar that a show of defense may be made. The National Biscuit Company made. The National Insent Companians base prosecuted more than five hundred in figurements of its trade-marks. "Uneeds figurements has been imitated by "Ulika," "Feanta," "Iwanta" and dozens of other trade-marks, "Iwanta" and Iwanta been imitated by "Ulika." na wordings

gas mantles, was infringed by "U-C-A."

In this case there was no similarity whatever in the appearance of the marks, but evidence was produced to show that evidence was produced to show that "Yusea" was pronounced "You see a," and that in sound the marks were precisely the same. Priority of registration of the "Yusea" mark was proved and the use of ·C-A" was accordingly enjoined.

"U-C-A" was accordingly superiors.

The word "Chasseuse" was held by the sourt to be an infringement of "Chartreuse"—both marks being applied to cordinle.

"Grape Nuts," a cereal food, was fringed by "Grain Hearts." " infringed by "Grain Hearts." "Old Crow," the name of a whiskey, was not in-fringed by "Old Jay." infringed

the other hand "Colonial Dame" used in connection with perfumery, was in-fringed by "Colonial."

"Chatter-Box," an annual publication for children, was infringed by "Chatter-Book," used as the name of a publication of the same general appearance and purpose.

### The Right to Use One's Name and Its Limitations.

A typical case of this kind is that of Royal Baking Powder Company v. Royal (122 Fed., 337-1993; 58 C. C. A., 499-500). An individual by the name of Royal went into the business of manufacturing baking powder. His product was sold in package of the same general appearance as those containing the product of the Royal Baking Powder Company. The court held that the respondent could use his own name, but "in the least onepieuous manner pos-sible consistent with the right to place his name and address upon the goods made by

A similar case is that of Von Faber v. A similar case is that of Von Faber v. and further "I consider as one of the Paber (124 Feb. R., 603). In this case; practest assets of this country the inventive the plantiff, a manufacturer of lead pen-genius of its people. I do not favor the offs, was the owner of a business founded in suggestion of the committee, that there 1794. The penols made by this firm had might be a slight stone in Patent Offse always beam marked "A. W. Faber." The fees. They should be kept low and overy defendant, also named Faber, began to encouragement and assistance given immanufacture penolis in the United States, ventors."

afficing to his product the mark "Faber." The court held that this was an unfair use of his name, and while he had a right to use his own name, yet he must prefix to it "John E," "Eberhard" or "John Eber-

The well-known chocolate man ers of Dorchester, Mass., Walter Baker & Co., have had to contend with many individuals bearing the name of Baker. In each case the decisions of the court have been to the effect that any Baker has a right to manufacture and sell chocolate and to use his own name on packages of his product, but his name must be accom-panied by some statement or distinguishing mark which will clearly differentiate his product from that of Walter Baker & Co. In the case of Williams v. Mitchell (106

Fed. R., 168-171) the court said: "One may not use his own name for such purpos n it works a fraud. If he us scriptive word, or a geographical name, or his own name, it must be so used as not to deprive others of their rights or to deceive the public, and the name must be accompanied with such indications that the thing manufactured is the work of the one making it as would unmistakably inform the public of

#### emblance Is No Infringen

A manufacturer of a lantern known as a "Hurricane" lantern claimed that the name of another lantern, called "Tempest," was an infringement. The court held that while there was a recembiance in the names in the underlying idea, they were so different in appearance and sound that any percent of appearance and sound that any percent of appearance and sound that any percent of the second son of average common sense would not e one for the other.

"S. B.," a trade-mark for cough drops,

"S. B.," a trade-mark for cougn urops, was not infringed by "B. and S."

"Weber," a mark for pianos, was not in-fringed by "Webster." In this case there is a casual resemblance in appearance in the two words, but no resemblance or very little, in sound.

#### The Plaintiff Must Come Into Court With Clean Hand

The courts will not use their power to perpetrate a fraud. A trade-mark conveying a misrepresentation of the compo tion, character or quality of the goods with which it is used, cannot be protected against infringement.

#### How Legislators View Patents

THE debate on August 7th in the Hous of Representatives upon the question of appropriating ten thousand dollars to investigate the Patent Office, developed ome interesting statements from different congressmen. Chairman Oldfield of the ongressmen. Patent Committee said, "the Patent Office has taken in and turned into the Treasury about \$7,000,000 more than it has taken out of the Treasury." In speaking of the great corporations, who are said to take men out of the Patent Office, the same gentleman said: "They want men who have started at the bottom in the Patent Office and have worked themselves up to th Commissionership or assistant Commis-sionership." If they want such a man, we do not recall an instance in which they got one, as ordinarily the force of such com-panies is recruited from the assistant ex-

aminers of the Patent Office Congressman Mann said, he thought the salaries in the Patent Office ought to be increased, but asked if Chairman Oldfield did not believe the Government would never be able to compete with salaries offered by outside people. Congressman owered by outside people. Congressman Bowman remarked: "I have had some business with the Patent Office and the work that they have done for me, has always been efficient." Mr. Bowman also said: "Ease in securing a patent is, I believe, of great advantage to the country,"
and further "I consider as one of the

Referring to the bill to codify the patent statutes upon which hearings have been had this year, Chairman Oldfield said, "a substitute for that bill will be reporte the House in a few days, but it is not believed that it will be possible to discus the bill or pass the bill at this session. This appears to settle the question as to any revision of the patent laws at this ses-

sion of Congress.

In the course of the debate, Chairma Oldfield referring to the compulsory license of the proposed new law, pointed out that it differed from other laws of the kind it that it did not apply to the original invent or, but only to those corporations or per sons who acquire patents for the purpo or with the result of stifling competition.

Speaking of the bill about to be intro du duced, Congressman Lafferty said, as he understood the bill, it would make it a penal offence for the owner of one patent to buy another patent with the intention of restricting or interfering with its manufac-ture or sale, and Chairman Oldfield replied that such was the intended result.

With reference to the Sherman anti-tru law, Mr. Oldfield announced that a great many of the best patent lawyers in the country to-day, take the position that the law does not apply to patent monopolies, but that the proposed bill will provide that the law shall be applicable to those monopolies created by the accumulation

Included in the debate was a brief dis ussion as to the constitutionality of deputizing to a court the fixing of a license fee Congesaman Cooper asking whether such fixing was a judicial function and suggest nxing was a judicial function and suggest-ing that a court cannot fix the rate, but it can decide whether the rate is confiscatory or not. At any rate, Chairman Oldfield said the bill is not to be pressed for passage at this session of Congress.

#### Notes for Inventors

Four Glass Drawing Patents.—I atents, numbered from 1,034,445 patents, numbered from 1,034,445 to 1.034.448, inclusive, have been issued for ventions of Mark J. Healy of B ford, Pa. The inventions relate particu larly to devices in connection with glas drawing apparatus and to the ring shields and fenders operating in the tanks of such apparatus.

Wanted: An Artificial Bait. Hurley, is well known among Washington outy fishermen, for his skill with the rod and red. A recent issue of the Washington Star says, that Mr. Hurley thinks it about time that some one invented an artif host for salt water fish and quotes the veteran angler as saying:

'Peelers make fine bast, and soft crabare not bad, but usually it is hard to ge them at places, where there is a chance to make a good catch. Some of the fishermer laughed at me, when they saw me taking soft crabs from the city for bait, but when they reached the fishing grounds, they were sorry they hadn't invested in some of them in the city."

A Moth-proof Fly Book .-- A patent ha been granted to F. J. Cooper of San Francisco, Cal., for a fly book which should be of interest to fishermen. The inventor, when he first started out in his career as a fisherman, bought everything that was recommended as needful. A generous as sortment of expensive flies formed part of his equipment. He found that the flies his equipment lasted must one season. When springtime came he went to his kit and was amaz find that the moths had cleaned his books of dozens of flies. That inspired the idea of a moth-proof fly book. The result is a book that is moth-proof, in which there is no metal in contact with the hooks, which is dust-proof and damp-proof. A celluloid window on the top of each of the envelopes constituting the leaves, permits the user to see at a glance just what fly he wants. The book is made on the loose-leaf principle and holds twelve to fifty-four dozen flies.

An Electrically Conductive Ink.—Two patents, Nos. 1,034,103 and 1,034,104, have been granted for the inventions of Hyman be any, applied to abanth manufacture. Eli Goldberg, wherein he provides a visible this country and designed for export.

writing ink having as one of its constituents a good electric conductor so that the ink when applied to the paper by an ordiwriting pen and dried conduct electronty along the characters thus produced upon the paper.

The Patent Medicine Situation in Eng. -A committee of the House of C mons has, for some time past, been holding sons in London for the purpose of in vestigating the law regarding the sale and rtisement of patent medicines in the United Kingdom

In the course of the investigation, it has seen developed that the sale of such medicines is equivalent to one package per year for every man, woman and child in the country, that as estimated by one witness, the amount of money spent on proprietary medicines in Great Britain alone in one vear amounted to \$12,166,250 or sufficient to maintain 40,000 hospital or sanatorium beds and that notwithstanding the enermous amounts expended, the solicitor to the customs and excise department stated, in answer to question from the chairman of the committee that there was nothing, in his opinion, in the law as it now stood to prevent any person making up any sort of mixture containing anything except obvious poison, from advertising it as a cure for any disease, and selling it to the public on payment of the stamp duty. He added that probably the police could prosecute if absolute fraud were established, but that it would be exceedingly difficult, in h judgment, to obtain evidence that would insure a successful prosecution

#### Legal Notes

Patentability Not Involved in Inter-ference.—The Court of Appeals of the District of Columbia in the interference sase of Putnam v Wetmore and Niemann has held that the question of the patent not be considered by the Court of Appeals and says, quoting a number of other cases "In interference cases we do not deter-mine whether either party shall receive a patent. The question presented to us is, conceding there is a patentable invention, which party was the first to invent or dissover the same.

Reasonable Doubt as to Similarity.— The Commissioner of Patents, in the case of J. & Riley Carr v. The William Schoilhorn Company v. Warren Ax & T Company v. Geo. H. Bishop & Co Radigan, Rich & Co. v. Draff v E C. Atkins & Company, has held in a trademark case that where there is a reasonable doubt whether there is deceptive similarity between the mark of an applicant and that of a prior registrant, and the consent of the registrant to the registration by the applicant of his mark is secured, that the doubt should be waived in favor of the applicant and his mark registered.

A Decision Affecting Absinth .- The of Food and Drug Inspection of the Agricultural Department has issued a decision, No. 147, under the section of the Food and Drugs Act which forbids the importation of any food or drug which is "of a kind forbidden entry into, or forbidden to be sold or restricted in sale in the country in which it is made, or from which it is exis "otherwise dangerous to the health of the people of the United States," calling to attention that importations of absenth into the United States, are prohibited, both because they come from countries which forbid or restrict its manufacture and sale, and because these products are injurious to the health of the people of the United States. The decision holds that the Secretary of Agriculture will regard as adulter-ated under the Food and Drugs Act absinth which, on and after October 1st, 1912, is manufactured or offered for sale in the District of Columbia or the Territories, or shipped in interstate commerce or offered for importation into the United States. The effect of this decision upon trade-mark registration is somewhat problematical. est al, especially as to the marks, should there be any, applied to absinth manufactured in

#### RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCHRWEISTO

#### Pertaining to Apparel.

Pertaining to Apparel.

BIGLT HISTORIA.— I. Assersa. 621 Broadwas New York, N Y A highly important
round outstand in this construction is the
Highlits between all the parts of the base of
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the back of the back of the best and mean
for fastening the buckle to the belt and mean
for sulpatably making connection between the
free end of the balt and the front end of the
buckle

DIMENS. -1D ZAVODNIE, 40 Walker St., New York N Y This invention relates partica larly to a lady's house dress, and an object is to provide a dress which will be next in appearance about the walks avoiding the ob-jection raised to the loose ditting morning dresses, and which will above to the walst of the wenter, irrespective as to whether or not correct act work.

#### Pertaining to Aviation.

FLYING MACHINE—T W CARRY, JR. 809 Canal 8t, New Orleans, La. It is the object of this improvement to provide a fying ma-chine with one or more sets of equilibrium planes and alierons adapted to counteract the tilling action and to reduce the inverse angle, whereby shorter turns may be accomplished with less danger.

with less danger.

FIJTING MACHINE—C A. HAMILTON, Rox 421 Sag Harbor, N Y An object here is to provide a machine of the helicopter type with a plurality of propellers, and means for direct ling the like of action of said propellers os as to traverse the machine in any direction; also a machine with a plurality of helicopter propellers, with nuena for throwing into and out of operation and out of operation

#### Of Interest to Parmers.

Of Interest to Farmers.

CRANK HEAD FOR MOWINN MACHINER.

—I. R. WRITERIER, R. F. D. No. 6. Belleville, III. A purpose here is to provide a crash, the set with a crash pin sleeve having a plurality of pairs of trundous interchangesible with the pitman, so as to take up the wear and owhere tregularities in the movement of the mechanism, so as to prevent excessive jarring.

#### Of General Interest.

GAROLENE FILTER—3. C KLATZL, 45 W NSG NI, New York, N Y This lavention pertains to a new form of gasolone filter, and an object is the provident of a device of the above indicated character from which the water or other heavy substance will be harden and projection of the device of the dead projection of the passions before and projection of the passions of the contract of the passions of the pa



the latter passes through the screens common to devices of this character. From this device the screen is now be resulty removed and device which is not because the screen is now to result removed and device which may be resulty cleaned and in which the several parts may be quickly assembled or removed. The engraving pictures a vertical sectional view of the filter. FILTERI--REALLY MAINTERING THE STATE OF THE STATE OF

filter CHEF FOR CARD HOLDERS J A
MARKET FOR CARD HOLDERS J A
MARKET FOR CARD HOLDERS J A
MARKET FOR CARD HOLDERS J A
N Y In the present patent the improvement
has reference to a bracket for pictorily mount
ing holders for display cords and an object of
mount of the company of

APPARATHE FOR SPLICTING BOTTOS AND CASHING—IL H. WITHOUT and H. H. Beers, Not 377 Need, Wesh The Object of their improvement is to provide a conveniently portain experient, by means of which the onde of ropes and cashes may be secretly belt while being spliced, and also to provide means which the pulce of the object of the pulce of the splice of the pulce of the pulc

Heating and Lightidae.

MATCH.—O. W. Currus, Blackwell, Wia.
This match is a substitute for the woodes one and usable in the same manner by stitking against any friction surface. A solid seehillt body is provided having at its forward end a pucket extending axially about distance, producing a tubular formation at the stitking and. In this pocket is packed an absorbest

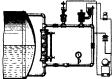
#### METALLIC MATCH.

SITE ALLO MATCH.

Such as absorber cotton saturated with lawssen or other inflammable fluid. Over the
and of the filled powlet and the end of the
tubular shell thereof is affixed a striking bead
to cover the absorbent and shell in a way that
the composition constituting the tip sirnly
address to the absorbent and to the shell,
more particularly the former, by filling the
intervities of the filling at the forward and
of the powlet. The upper shetch is a perspecific view and the lower a longitudinal of the pospective s

section

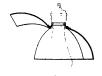
ALARM SOUNDING DEVICE.—B. A.
GASCI, B. F. D. No. 1, Box 158, Seattle,
Wash. The object of this inventor is to provide a device which will in all cases sound
an aiarm when the pressure communicating
therwith falls below or rises above preditermined points, the device being so constructed that the aiarm may be sounded at



ALARM SOUNDING BEVICE.

any points desired relatively to the device.

Another object is to provide in connection with
the said device beass to affect communication
with the atmosphere to reduce the pressure
when the pressure reaches a point where the
alarm is sounded The illustration shows a
after sectional clearation of the invasion, shows
LAMP SHADE.—N. M. McGRER. Clifton
Apie, 231 N. Breedway, Los Angeles, Call
The object of this investion is to provide a
shade for lights or lamps, more particularly
for incandescent electric light bulbs, so contails) or existing varieties light of the adjusted to reflect the light downward, or while
shading the greater portion of light, enable
the light to be projected and reflected in a
particular direction. The device may be used
placed in leef for warning feet and other parts
of the body. Hospitals will find this shade
of value in doing away with paper pinned



Household Utilities.

Hardware and Tools,

RIVET CALKING TOOL—J Woodward,

Box 2001, Lectonia, Ohlo The aim of this

timester is to provide a new riset calking sarranged to jernia rayed change in the cells

tool, which is simple in construction and ar

allow quick and accurate adjustment to accompany the construction of the construction and ar

allow quick and accurate adjustment to accompany to the construction of different forms of rivet or boil brads, intermediate the said and raying discs. For

one different forms of rivet or boil, brads, intermediate the said and raying alians. Find the rivet or connecting the affined in the rivet or connecting the affined and raying of links

with a view to calk or tighten the rivet or connecting the affined and are rived as a reason of the connection of the rivet or connecting the affined and are rived as a reason of the rivet or connecting the affined and are rived as a reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rivet or connecting the affined and reason of the rea

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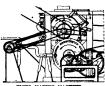
the side rails to hold the latter speed the shired distance apart. The engraring allows a perspective view of the structure standed ready for two; a plan view of the structure standed ready for two; a plan view of the structure folded; and a cide clevation with the parks is folded position.

COVER FOR HONNING BOARDS.—T. M. BROOKARY, 762 Speading St., Minsira, N. Y The intention have law to provide a cover for an ireasing board arranged to permit plain intention. The structure of slagres can be applied to the provided of slagres can be applied to the board or removing it therefrom.

Machines and Mechanical Bovices, ADDING CUNTER\_.w. F. McLahr. Box 685, Marshall, Minn. This device will accurately measure the travel of a redge-cating element. In counters now in common use, it is not possible to accurately measure the travel of a reciprocating body, such as a piston rod of a pump, due to the fact that the counter does not register until the entire, errole has been made.

stroke has been made. A. Kira, care of Wells & Newton, Ave B, 17th and 18th Sh. New Tork, N. T. The object here is to provide as all washes which will thoroughly cleaned and all washes which will thoroughly cleaned and implant, the washer being constructed with a hollow shaft, supported at one end by the shaft in the bollow shaft, which is disposed in and is keyed to the hollow shaft, which is disposed in and is keyed to the hollow shaft.

MLEND MAKING MACHINE FOR STAPLE GOODE.—A. I. Gusav, Sanford, Maine. By this mechanism mixing and blending are dose with a minimum of band work, the masterial boday thoroughly intermingled and cleaned during operation, the action being such that the material is fed into the naction in charges of predstarmined size. these charges being ad-mitted at literatis when various movable parts



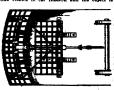
are in position for the charges to be taken in. Mixing and blending can be better done if the material is first operated upon in the mixing chamber and thence transforred to another mixing chamber and there perated upon under somewhat different conditions. The view shown is a fragmentary side elevation, and shown the first mixing chamber and parts associated threwith.

#### Pertaining to Recreation

Persaining to Recreation.
TUT AEROPLANE.—A. B. Hacut, 64 W.
88th St., Manhattan, N. Y., N. Y. This invastion relates to toy aeroplanes, and the atm is
to provide one which may be constructed at
trifling expense, so that the aeroplanes mannfactured in quantities, and may be given away
for advertising purposes or to be sold for a
few cents.

Hallways and Their Accessories.

CAB PENDER.—C. B. MARTIN, Room 18, t'ambridge Bidg., Portland, Ore. This invention relates to car funders, and the object is



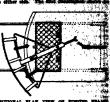
INVESTED PLAN VIEW OF CAR PENDER

to provide one which is mounted by someone on a rail secured to the car, locking means being provided for holding the funder in more than the control of the property of the p

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Harrist School Co.

č.



invaried plan view of the fender mountile, as a car; and the second is a cectional plan view showing the pivoted frame, the agent disposed the textunder. It is mad, and the measure by which the lent is connected with the pivoted

Of Entereod to Survivors
WHENL. J. E. McWittelars,
Okia. This invention relates ay
wheels, and more particularly con
traction wheel, especially latended
farm implement, for field work a
plowed ground. The principal approvide a raction wheel especially
use on farm implementa, the win
lag a number of staggered species ot to -th



engagement with the ground whereby the implement may be drawn thereover. This investion overcomes the disadvantages following the control of the control of

Designs.
DESIGN FOR A LAMP CLUSTER.—J. D.
Ross, Neattle, Wash. This oreanestal design
for a kamp cluster when nounted upon a pole,
standard or other support, presents an slegast
of which rest on a base, while the two remaining
and outer once hang from the onde of
the form constituting the fatter. The three
upper globes are somewhat larger than the
lower unes.

Norm.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

District, the paper.

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phasics. Can a man exert pail than his own weight, contidon that he may take? a steady downward pull on precion, a man usenno pull graight. He will then him practice the will then him practice downward force on a regist by giving a jack. By ad inertia he greatly increases ton.

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Tan Kinddom of Dust. By J. Gordon Ogden, Ph.D. Chicago: Popular Me-chanics Company, 1912. 16mo.; 116 pp.; illustrated. Price, 50 cents.

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By Carl Dichman. Translated and edited by Alleyne Reynolds New York:
D. Van Nostrand Company, 1911 8vo.;
334 pp.; illustrated. Price, \$3.50 net.

D. Van Nostrand Company, 1911 Svo.; 334 pp.; illustrated. Price, 33.50 net.

The manufacture of steel by the hade process presents many problems which have thus far failed to bring forth adequate solutions are present to the control of the contro

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# The Gyroscope

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interesting field, when the garage capable of occupying ieratific American Supplement 1645—The The of the Gyroscope, is an excellent article, treating subject mathematically rather than popularly.

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### VII.—Shall My Boy Become a Naval Architect?

By John Ritchie, Jr.

This is the seventh of a series of articles intended to set forth fairly the business po ties of the technical professions. The articles are prepared by men who are cons the more emportant technological institutions of this country and who are for the most par ent educators. Because these teachers have instructed hundreds of young men in the principles of engineering, they are best qualified to write upon a subject so immensely import ant in the future development of American manufacturing industries.—Editor.]

setts Institute of Technology. To him struse mathematics combined with data there have come young men, grown men, obtained from experimental work, and not neve oney come young men, grown men, botamed from experimental work, and not nevel officers, from the nations of Japan it let least important factor, particularly and China that are developing their in the use of what are called "indeterminaters for the first time, and have sought ates," is that rare quality, good judgment, the best instruction, the former being represented by an officer who was on the while no later than the school year that has just closed an ensign in the Chinese navy was one of his students with others of his countrymen. Then again the of his countrymen. Then again the United States, recognizing the standing of the department that Prof. Peabody is maintaining, has made it a law that the graduates of Annapolis who are to become naval constructors must come to the Massachusetts Tech for two or three years for the finishing touches.

First, it seems worth while to note riefly what is meant by maval architecture and naval engineering. This is due to some of the changes continually effected in this busy world. When ships were of wood and the towering poops and foreastles of the three-deckers were suscer tible of architectural treatment, the rela tion to architecture was self-evident. Nov that ships are built of steel and crammed with machinery the relation to engineering is unmistakable. But at all times from its artistic side the designing of ships and especially of yachts, has never failed to appeal to those who consider the ship as something more than a mere conveying or fighting machine.

The adaptation of engines to ships, the increase in the functions that machinery are expected to fulfil, the growth in size and complication, and the more precise fitting of the vessel to its work have called more and more for a stronger grasp of principles by the probitect as well as greater specialization by the engineer.
And the story does not end here for the yards may be adapted each to its own vork, some for warships, others for peace ful passenger greyhounds and others still for capacious freighters, while towboats, tornedo craft vachts and motor house are calling to-day for extended further specinlization.

It may thus be seen that the field is wider than appeared at first, that there are opportunities in large number for the employment of technically trained

"The first reason why a young man should become a naval architect," said Prof. Peabody, "is because he wants to, but he must be intelligent, competent and willing to work." The suggestion of this successful professor followed the lines that the designer of ships and yachts, es pecially the latter, must have a combination of artistic sense and constructive tion of artistic sense and constructive ability, which will find its natural outlet in ship building. Such a person should be allowed to follow his natural bent. There are always a reasonable number of young men in the community who co sful naval architects if not discouraged by parental caution.
"A second reason," continued Prof. Pea-

body, "is because there is a much wider field to which the graduates of such a department should go than the public realizes. Anyone who expects to have to do with the designing, building or managing of ships or building marine engines or motors for boats, will be better fitted if he takes a course in naval architecture and marine engineering." The fact is that this profession broadens the knowledge of the man who enters it. eage of the man who enters it. It is doubtful whether any other one calls for

This was the question asked the other an intimate knowledge of so many differ-This was the question asked the other in minimate knowsedge of a knowledge of the lead of the Department of Naval Architecture trades are represented in the modern ship and Marine Engineering at the Massachu The design demands a knowledge of aband this is developed by the study. Then the naval architect must be conversan with shop work in all its branches and with steel manufacture, foundry prac-tice, steam engineering and electricity. It is indeed a broad education that is the foundation stone to success in naval architecture

CONTROL OF THE STREET AND THE STREET STREET, AND THE STREET STREET STREET, AND THE STREET STREET, AND THE STRE

"Such a course combines the advanta of broad study in engineering," this lead er in naval educational work went on to say, "including civil and mechanical engineering with the concentration on a spe-cial profession, and in particular the study demands all the advantages in the way of equipment that a large and pow erful technical institute alone can fur-

Then there is the advantage of close personal contact with the teacher in comparatively small groups of students. I must not be forgotten that although the ships of the sea represent the outlay of great capital, they can be counted as but small when compared with the enorr engineering enterprises of the land. It is therefore, true that while the great de-mand for land engineers is scarcely suppiled by the output in graduates of the great schools, relatively small departments and in comparatively few schools will suffice to supply the need for nava architects. There is room in the nava world for all who are now taking course, there will be room in the future for an increased output, but there must always be the smaller groups of nava students and the consequent closer touch with the teachers.

Experience has shown that the work of the course really appeals powerfully to all young men who have any taste for the sea or for ships, and they evince an active interest in the work. "They learn to strive hard without feeling the tedium of uncongenial work. This of itself is a most valuable education, and many young men who have intended to go into business have taken the course because they

There must, of course, be considered the business opportunity for members of the profession. This, according to Prof. Pea body, is good. There has for several years been a larger demand for graduates than the school could supply, and this there were two or three opportunities for each man who graduated.

Most important in the whole considers tion is the fact that a brighter day for ship building has already arrived, and the future cannot fail to show an in crease of opportunity. The men manning British shipping are now evincing great dissatisfaction with the miserable conditions of the present day and are li demand higher pay and other changes which will tend to lift the life to a level where it is possible for it to attract where it is possible for it to attract American, especially those who like that kind of life, and there are besides special futures for yachting and motor boating which already begin to cut important figures.

Provided he is intelligent, com and diligent, for the young man who is willing to devote himself to his studies there are at this moment excellent opportunities in naval architecture and m engineering, and these opportunities are



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Uses of Cement in Sculpture (Concluded from page 198.)

and the steel reinforcing tower, 8 feet in diameter, was built in its place. tower ran the entire length and ended in a dome just below the neck, and was designed to support the head and shoulders of solid cement. Thirty-eight 1-inch twisted steel rods were cemented 2 feet into the solid rock with molten brimstone and red hot sand. This was done, not to anchor the statue, but to steady the st reinforcing cylinder. Twenty-four rods were used in the circular tower; 14 anchor rods passed up through the folds of the ry, joined the structure of the dome and then passed up into the head. This had to serve as a scaffold from now on and retain its form.

For the circular reinforcing 4-inch isted steel rods and 1/4-inch galvanized wire was used. The diameter of the tower was expanded, one wire placed on the inside and one on the outside, and twisted between the rods until tight, thus reducing it to its original diameter.

The solid concrete base (measuring 18 by 18 by 3 2/8 feet) was cast on November 10th Maintaining a water supply was one of the chief problems of the The water had to be pumped up from the river below to a 5,000-gallon capacity storage tank, made in the ground near the statue, then lifted into another tank with an improvised water let; here it was

steam heated for mixing the cement.

An opening was left in the base below the ground, and six sections of the specially designed, collapsible metal inner forms, 7 feet in diameter, were taken in and set one on top of the other and joined together with taner dowel nins. Then on November 14th and 15th the pedestal was cast to within 6 inches of the figure

Preparations were then made for casting the figure An improvised derrick with grooved wheels was set over the mold with the figure The forms were taken off the pedestal and a chute put in to convey the the figure ement from the mixer to the bottom of the shaft into the hoisting tub, and a small radiator was used to heat the inside of the mold. The first attempt was made to cast the figure on November 29th, but this was unsuccessful owing to inadequate prepara-

It has frequently been asked why the final and most important work was not done sooner and in more favorable weather, or left until the following spring It must be remembered that the whole operation of building a heroic statue in cement was an experiment, and could progress only as each new difficulty, which arose in connection with it, could be overcome. Delay in the material first used was perhaps the main reason for retard-ing work. Taking into consideration the action of freezing weather on water-soaked plaster, the prominence of the location of the statue, and the terrific wind storms which would sweep around it during the rest of the winter, it was imperative that the building be completed, to avoid a repetition of the first year's work

Another 16 horse-power steam engine four large tubular radiators, and one 26-foot steam coil were procured A 30-foot gravel bin, 5 feet high, was made and the steam coil placed inside it, on edge. The four radiators were placed inside the scaffolding near the mold. The engine being considerably lower, everything was steam connected, and the pipes boxed, with return to the boiler. A system was also devised for warming the water which was being pumped up from the river. The whole construction was inclosed by canya and sheet tin, all holes plastered shut, and after a final tryout the work began again on Tuesday, December 20th, 1910, at 5 P. M. The thermometer indicated 2 degrees below zero. Two crews of fourteen men each were employed for day and night shifts

. After all the preparation and trials it was a sight never to be forgotten—the two steam engines belching forth thick smoke and flame; the frozen chunks of

# Say Farewell to Every Corn

folly. It is dangerous, too. A slip of the blade often means an infection. Some-times it means blood

surgery doesn't be-long to these intelli-gent times.

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done in a jiffy. The pain ends in
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the corn. In 48 hours the whole corn
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No soreness, no discomfort.
In the way in corns have been ended
in this way. Let it remove one for you. That
will show you the end of corn
troubles forever.

in the picture is the soft  $B \triangleq B$  wax. It loosens the corn, protects the corn, stopping the pain at once, wraps around the toe. It is narrowed to be comfortable, is rubber adhesive to fastes the plaster on.

# Blue-jay Corn Plasters



# Aviation

¶ Two topics are of paramount importance just now in aviation. The one is the possibilities of the hydro-aeroplane—the flying boat in popular parlance—and the other is the flying machine as a military weapon.

¶ In the forthcoming mid-month September issue of the Scientific American, which will issue on September 14, these two subjects will be authoritatively discussed.

¶ Mr. Carl Dienstbach writes on the hydro-aeroplane. He points out how important is the development of the flying boat, because at last we have a vehicle of the air which is safe and which means much for the advancement of flying as a sport.

Major Bannerman Phillips of the British Army, a noted European authority on the military aspects of aviation, will write on bomb-dropping. He will show how much or how little is to be expected by dropping high explosives on an enemy's force from a height of half a mile, basing his comments on the achieve-ments of aerial grenadiers in the Tripolitan campaign and on the results of the bomb-dropping contest held in France.

¶ Dr. Alfred Zahm, America's leading authority on aero-me-chanics, will show in a popularly worded article what has been the development of laboratory work since the day of Langley. If the flying machine is to become a really practical vehicle of the air it must be developed by the same methods that have given us giant bridges, huge dynamos, highly ramified telephone systems. That is why Dr. Zahm's article, dealing as it does with investigations made by engineers and physicists, is of immense practical value.

There will also be the usual Scientific American features the short pithy articles on current scientific events, with many bright illustrations of the latest inventions and scientific apparatus, the latest news for inventors

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out piping hot below; the water boiling, a full steady stream being pumped from the river; the heisting signals; a typical wastern blissard blowing; and above all, the men, cont ed and happy, working away with clocklike regularity, each at his as The granite scr arate from the other concrete by inserti

a row of tins 2½ inches from the mold; these were raised as the work progressed. When a form was full the lowest section was collapsed, hoisted and set on the tot ection until nineteen sections had been

A large hole was cut in the back of th shoulders. The metal form (7 feet in shoulders. The metal form (7 feet in diameter) for the dome was hoisted on the outside and slipped into place, the bucket was changed for outside hoisting, reinforcing rods for the dome were wired into place and a form was built between ome and the window on the arn

The work now progressed very slowly, to as to give the cement on the dome a chance to set and help support the thirty tons of solid concrete being placed abo The only breakdown occurred at 3 A. M. on the last day of the work. With the temperature below zero, both engines suffered a temporary breakdown for half status

eing thrown into the bin and shovelled an hour, and all but from the h was then oil a level with the er At this stage the ce in pails. On Decemb coment was passed up abor 30th, 1910, at 2 165 P. M., the huge mold was full. Heat wa applied for two more days and then the Spirit of Black Hawk, as the statue is ten called, was left to the elen the following springs

the rottowing spring:

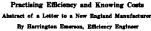
I think the most exciting time in making a statue—and I am sure all sculptors and bronze founders will agree with me—is the moment when the mold is about to be chopped off. Will it come out perfect or not? Needless to say this part of the work had to be investigated as soon as

work had to be investigated as soon as the weather permitted.

In the early spring a party of three, Mr. Lorado Taft, Mr. Wallace Heckman, attorney for the University of Chicago and upon whose land the statue stands and I, investigated the result of our labor I took photographs from a scaffolding as the piece-mold was taken off the head and shoulders. So far the result was entirely atisfactory.

Two weeks later the rest of the mold was taken off by splitting it from top to bottom and prying it off in huge slabs. At last there emerged a perfect—except for a few minor defects—monolith cement





DEAR SIR: In compliance with your penditures to a cent and spends in pro-

Drequest of last week, I give you here-with the substance of my remarks ou ractising efficiency and knowing costs.
In the operation of any undertaking o may attain high afficiencies and know lif-

tle about costs, or one may know all abcosts and practice no efficiencies. Which

When I was manager of a glass work occasionally took Sunday dinner with a French glass-blower. Such meals for flavor and savoriness I have never eaten anywhere before or since, not even in the best restaurants of Paris, London and New York. The wife who cooked and served the meals was a French peasant woman, unable either to read or write. Her husband gave her \$20 a month to run the table. She could scarcely count, se she would buy one thing at a time and pay for it, receive the package and change and then buy another item. She also had s garden full of marvelons vegetables and herbs. My! but she was efficient as to quality; she did not pay more than she ought in price nor did she buy table salt mixed with corn starch at \$0.10 a pound when rock salt at \$0.02 answered the pur pose as well. My! but she was efficient as to quantity; she did not buy more than she needed nor did she ever use more than enough. This peasant woman did not anything about cost-keeping, but she was a born and trained manager, practising that French thrift which has made the French nation one of the rich-

est in the world. I also knew a young American who had 'aystem" on the brain. He subdivided ment and to advocate a change. Nebod his expenses under a great number of knowing where or why the losses occur heads. He did not have a very large inome-had to earn or beg or borrow it. He would pay any price that sellers asked, and he bought fourteen-dollar shoes when hree-dollar shoes would have answered. He had twice as many suits as he needed. and he got very little use out of them. It the cost up to \$3 per hundred pounds was the same with food, with lodging, and There is, therefore, a great difference be with travel. On trains he paid extra

with travel. On trains he paid extra fares, took the drawing-room, but spent most of his time in the buffet car. My! but he was inefficient; paying more than he should for everything, using higher qualities, buying more, using more than he should. Yet his accounts were beau drawn up in blue and red and green inks as well as black.

Which quality is more important in running a plant, efficiency or system?— the efficiency of the Scotch, the Quakers. the efficiency of the Scotch, the Quakers, the Yankees and the Swiss, or the sys-tem that balances up United States es-

portion to what it gets four times as much money as the Swiss Republic? No doubt there are efficient French

write and figure. No doubt there are systematic men who also practise effi-ciency, but the point I wish to make is that efficiency and system are totally dif-ferent and that efficiency is by far the more important of the two. If I knew that every part of a plant I was managing was being operated at 100 per cent efficiency, detailed costs would be rela-tively unimportant. To know every cost yet not know what the efficiency is, whether high or only 50 per cent, is as reckless as to run a steam boiler without safety valve or steam gage, trusting

Efficiency is the relation betw is and what ought to be. To determine what actual costs are is a cierical task but this helps very little if we do no know what costs ought to be. Also, eif we are told what cos requires all sorts of skill to attain th

that it will not blow up.

We may be running a foundry in which our custings cost \$2.75 per hundred pounds. We may know that in another foundry similar castings cost \$1.75 pe hundred pounds. In such cases it is very usual for the superintendent to blame the equipment, to assert that if b had a new foundry with new equipment had a new foundry with new equipment he could undoubtedly surpass the rival It is also quite usual for the owners to blazue the superintendent or the equip olua If the where and the why ar known, a thousand-dollar investiment might cut the cost to \$1.75. If the facts and remedies are not known, the emo There is, incremore, a great universal tween the relative importance of cost determinations (only a fraction of the efficiency principle of "Reliable, Immediate Adequate and Permanent Record the skilled experience that can determin fair standards, and there is also a gree difference between the analytical shilling to determine fair standards and the ex-

To illustrate from horse resing. ancients five thousand years ago rade horses. Although it would have been ver-easy to have most over a measure course and to have timed the second over





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of a pendulum regulated to an hour glass is does not seem that even these elementary records, corresponding to cost accounting, were applied until about one hundred years ago. After thirty years of cords as to trotting horses, or en who had given the subject life-long practical study set the extreme achievement of the trotting horse at two minutes It took forty years more of intense reline ent of track in shape and surface and banking, intense refinement of shoes and harness, intense refinement and improvement of sulky, intense and special skill or the part of driver as well as immenterment in the physical welfare and train ing of the horse to realize two minutes out of the most carefully and selectedly bred horse.

Efficiency work is not overhead ex pense. It is a productive department whose motto is "Wealth from Waste" An efficiency department is inexcusable unless it yields in gain even the first year several times what it costs. If there is a big loss due to inefficiency, it may cost anywhere from \$5 to \$50 to rescue \$100 If the plant is a small one the percentage of cost to saving is naturally higher than if the plant is a large one, though an efficiency scheme in its elements is essentially the same for the little plant as for the big one. Even if in a little plant an ex-penditure of \$50 yields only \$50 act profit. it is after all a remarkably productive in vestment

efficiency counselor is that he knows what not to do. If a chicken is put in a cage or maze from which it can escape only by taking one course out of a hundred, it will take it half a day of anxiety, of fluttering, before it accidentally strikes the right combination and gets out. If put back again it takes a shorter time to get out, and finally by not taking the wrong paths it makes its way out in a few minutes. Its improved efficiency is due to the omission of mistakes.

Any one can open a tumbler lock if he knows the combination. If he does not know it, the chances against hitting it by accident are many, and this alone consti-tutes the safety of the lock.

So, too, in efficiency work, there are core of things that must not be done for every one that must. It requires thorough knowledge of efficiency principles and long experience in their application to know what "not to do," and in knowing these pitfalls lies success in applying efficlency principles Very truly yours,

HARRINGTON EMERSON

#### How Much Bread Will a Given Quantity of Flour Make?

EW people, other than the bakers have even the most remote idea of how much bread a barrel or any other quan-tity of flour should yield or how much more one brand will make than another This is a much more important matte than the mere question of whiteness of than the mere question of winteness of the bread, or even of its real or apparent lightness. For some brands and lots of flour are much drier than other kinds, and will absorb much more water to bring them to the same degree of dryness as other brands, or other lots of the same brand. Further—and what is of much more importance—the quality of gluten contained in the flour, which is the more nourishing of the two principal con-stituents, determines much more largely than does the starch, the amount of water than does the staren, the amount or water that the flour will take up. The best should be the cheapest, if the amount of bread made per pound under the same conditions is proportionately greater than the price demanded therefor. I happen to have on hand data concerning two wellknown American brands, namely, "Gold Coin" and "Seal of Minnesota." From the former, a good baker or housewife can make about 345 pounds of dough per barrel of 196 pounds of flour, that is, 176 pounds of dough per 100 pounds of flour.
Of the second brand, the figures at my
disposition show 268 pounds of baked
brand per 100 pounds of flour.



THE EDISON CONCRETE HOUSE While the process which is a constituted, how much it from an other temporary treatment relating to the attractor's relating to the attractor's

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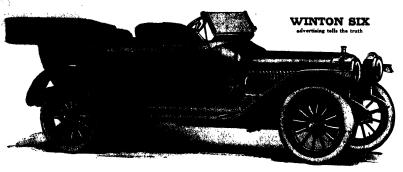
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### The Silent Waverley Sheltered Roadster





# THE PRICE YOU PAY vs. THE QUALITY YOU GET

BSOLUTELY misleading is the idea that price represents quality.

That mistake costs American automo-

The second of th

bile buyers millions of dollars every year. Right here is the proof.

#### PRICE CLIMBS ABOVE QUALITY

Up to a certain point and no further, the quality put into a car by its maker forces up the

car's price.

There is a limit to the actual quality any maker can put into his car. But price never can and never does stop there. Price climbs and climbs, often far beyond the cost of car quality.

Consider the records shown on this page

These facts and figures are not secret. You can get them, as we did, from commercial sources. Some of them were printed in automobile trade

We simply take known figures and analyze them for you. But to make sure of having an absolutely reliable basis of calculation, we had a statement prepared by Haskins & Sella, certified public accountants. (See table No. 1.)

#### A LOAD OF \$3,000,000 A YEAR

This record covers six representative makers of high-priced six-cylinder cars. These makers are under a burden (for stock dividends, for interest

on bonds, mortgages, and gold notes, and for plant depreciation) of \$2,435,686.78 per year. That's only part of it. To pay off funded debts, notes, and mortgages, these makers must set aside money every year for a sinking fund. If we allow ten years for the whole debt, the annual charge for this item is \$665,794.79. Making a grand total charge of \$3,081,481.57 per year.

#### NOT AN ATOM OF QUALITY IN IT

You need not be a banker or a broker to know Tou need not be a source of a store to around that dividends, interest, principal, and depreciation do not add a single atom of quality to any automobile. The quality of cars has nothing whatever to do with this three million dollar charge.

whatever to do with this three minion donar charge.

But this charge does affect the price of every
car made by these makers. Legitimately so.
Stockholders are entitled to dividends. Holders of bonds, gold notes, and mortgages are entitled to both interest and principal. And, to keep from wasting his business, every maker must provide for depreciation.

#### BURDEN COSTS YOU \$342,38 PER CAR

Makers who carry this three million dollar burden are forced to charge enough more than their cars cost in labor, materials and quality, in order to get into their cash drawers a sum of money (over and above what they pay out for manufacturing) to discharge this burden.

#### Table No. 1

### FINANCIAL OBLIGATIONS THAT BOOST CAR PRICE

These Squres covering aix representative automobile manufacturers re compiled by Huskins & Selb. certified public accountants, from infor-sion supplied by the Winton Computs. Interest on funded debts calculated as the races of interest which the bonds cury
Initrate on notes and morgages payable where not specified in the
information calculated at the rate of 0% per anium
Blistands on preferred size, where not fixed valuated at the rate of
7% per annum
Distance on operating size, where not fixed valuated at the rate of
7% per annum
Distance on one common stock, where not resublished valuated at the
rate of 4% per annum
Despectation of buildings and equipment calculated at the rate of 4%

,	Amount	Annual Requirements (Estimated)
Capital stock, preferred\$12	300,000 00	\$818 060 00
Capital stock common 13	190 800 00	469 816 00
	\$50,000,00	141 000 00
Notes and mortgages payable4	107 947 91	226 476 87
Total 532	349,147 93	\$1 675 152 87
Depreciation of Building and Equipment Item= 5% of \$15,206,678.46 .		\$760 111 91
Total Annual Requirements for Interest Divide Depreciation of Buildings and Equipment		\$2 415 686 78

Divide this total charge by 9000 (the total car output\*) and the answer is \$342.38 per car.

So that, when you buy a car made under this burden, you pay \$342.38 as your portion of an expense that does not in the remotest degree enter into car quality.

### AND HERE IS THE POINT

We maintain that it is not possible to put into We maintain that it is not possible to put into an automobile more or better car quality than you will find in the Winton Six

The Winton Six sells at \$3000 Salesmen selling cars at higher prices will tell you that it lacks in quality what it lacks in price

That statement is completely false

The only thing the Winton Six lacks is super-price. It lacks that because the

### EXPENSES THAT ADD NO OUNCE OF CAR QUALITY

This table, compiled by ourselves, shown how any representative makers compelled to charge you more than \$600 per car for expenses that do add a single ounce to car quality

at a single ounce to cat quality

Il interest, thirden, and depreciation requirements six makers, as shown in the Heaking 4 bells table \$2.415,686 78

dishibing fund requirements aix makers (10 % of book 450). nents six makers (10 % of 8342 18 340 00 Total requirements per our for items iluted shove \$682. IS on Company's total requirements per car for similar

\$0.00 to cost to you pur car of six makers for expenses baving absolutely pothing to do with car quality

Winton Company, being wholly free from debt and from over capitalization, is not forced to inflate the Winton Six price. COMPARE \$80 AGAINST \$342.38

Here is what we are **forced** to charge you for the same items shown in tables 1 and 2, and at the same or agher rates.

Stock dividends (6% on \$1,000,000) \$60,000
Plant depreciation at 5% 60,000
Interest on bonds, mortgages, and gold notes
Sinking fund

Total per year Averaging per car (1500 output) \$120.000

This \$80 is \$262.38 less than must be charged per car under the three million dollar burden. And in neither car is quality involved at all.

#### AGAIN MORE PRICE, NOT QUALITY

There's still more to add. Consider detailet's discount. The average price of the ax cars is \$1700 higher than the price of the Winton Six. The deder gers 20 per cent discount. Twenty per cent of \$1700 is \$140. And wo up as \$450 more in deder's discount mone of three cars than you do on the Winton Six. does not not one of the above, and won with that and in the face cars. \$40.2 18, shown above, and won with that and \$600.2 18 that we are not forced to add to the Winton Six price. (See table No. 2)

#### WHY WE PRINT THESE FIGURES

WHY WE PRINT THESE FIGURES

The Winton Company is practically the only one in America selling high grade Stars at \$1000 or more that are publish these fars and figures. Become the Winton wholly free from any tremembous burden not connected with car quality. We own one plant set free, and we owe nothing on bonds, mortgages, of gold notes with care quality. We own on plant sets free, and we owe nothing on bonds, mortgages, of gold notes with care quality. We own on plant sets free, and we owe nothing on bonds, mortgages, or gold notes are proposed to the set of the se

#### SIMPLY ASK TO BE SHOWN

Compare cars hist in other cars, if you can, any equivalent of the price charged you above \$3000.

The \$3000 Winton Six is the car that converted

in time cars, it year, one, any equivalent of the price.

The \$1000 Winton Six is the car that converted high-grade makers and buyers from four cylinder cars.

So wholks the world's lowest swom repair expense record—2.2 cents per 1000 miles.

It is the ponore self-cranking cars, and its makers were the first in the world to make Sixes exclusively. It is the only high-grade on that has not required a first control of the co

mail it today

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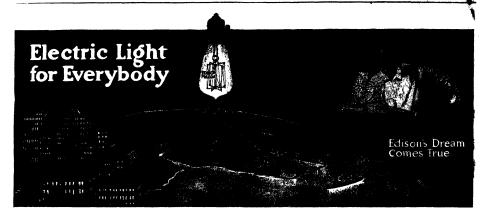
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The Dream. Thirty-three years ago, Edison put a little paper horseshoe filament, that he had carbonized, into a glass bulb and pumped out the air Next he passed a current of electricity through this horseshoe. As it glowed white hot, lighting up the darkened room, the Wizard of Menlo Park dreamed his great dream which has now come true-"Electric Light for Everybody "

Progress. Following Edison's lead, inventors, manufacturers and lighting companies have continuously improved not only the lamps that give the light but also the service that makes electric light universal. The result is so startling a reduction in cost that ten cents today buys as much electric light as a dollar did twenty-five years ago

Tungsten. One of the greatest steps in advance was the Tungsten filament lamp that actually gave nearly three times as much light as carbon filament lamps of equal current consumption. But this Tungsten filament was too brittle for every-day use in the places and ways in which people were used to using electric lamps

Drawn Wire. A brilliant invention has esulted in the production of drawn Tungsten wire, stronger than steel. This wire is used to make the filaments in Edison Mazda Lamps. So sturdy are these filaments that today Edison Mazda Lamps can be used any way, anywhere, any electric incandescent lamp is available

Uses. Millions of these sturdy Edison Mazda Lamps are now used for every lighting need. They light streets, homes, stores, factories, offices, churches, theatres, electric signs, ferry boats, trolley cars, railroad wains, battleships, automobiles, motor boats-every way and everywhere There are all

# Everywhere

Electric light for all the world - in city, village and country, on land and sea - this is Edison's dream come true.

sizes and styles from tiny battery lamps giving half a candle power to great lamps giving 800 times as much.

Economy. Edison Mazda Lamps could not be used for all these purposes if they were not sturdy -they would not be used if they did not give more light for less money than any other type of lamp

Without consuming any more electricity, Edison Mazda Lamps give twice as much light as the best electric lamp previously in common use

Everybody-Everywhere. That's why electric light users everywhere are replacing old lamps with Edison Mazdas. That's the reason electric light is so chean that the tiny cottage or small store can now afford better electric light than was possible a few years ago for any "avenue mansion" or department store

New Lamps for Old. If you are still using old style lamps put Edison Mazdas in the same sockets-and compare results Wherever Edison Mazdas are used they are more economical than any other type of lamp.

Electric Wiring. The past few years have witnessed a great advance in wiring methods together with a steady reduction in cost. Invisible electric wiring is now so simplified that you can install electricity at surprisingly low cost and with little disturb-

Reflectors. Almost as great as the advance in electric lamps have been the improvements in suitable reflectors. As fast as lamps become more and more efficient, the reflectors become more and more effective distributors of that light, thus practically doubling the amount of useful light obtained from a certain amount of electricity. Altho made in many different sizes, styles and finishes, these reflectors are of three general types, "extensive," "intensive" and "focusing". Almost any angle of reflection can be obtained by a judicious use of one or more of these types. Holophane glass and metal reflectors are usually recommended for all standard sizes of lamps. For the large 400-watt and 500-watt Edison Mazda lamps especially attractive Mazda Monolux Reflectors have been designed

The Dream Comes True. Thus with better and more economical lamps and reflectors, installed more simply and inexpensively than ever before, everybody, everywhere can afford electric

Where to Buy. Ask any lighting company or electrical dealer about modern electric wiring and the best sizes and styles of reflectors and Edison Mazda Lamps for your special needs.

For expert advice on anything electrical write out

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# SCIENTIFICA MERICAN

### THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

XOLUME CYT. ]

NEW YORK, SEPTEMBER 14, 1912.

#### The Düsseldorf Exposition of City Building

By Our Berlin Correspondent

TOWN planning as an art is of quite recent date. In olden times towns were mainly ableters against the attacks of quistide foes and accordingly were encounteed by wells into which in inhabitants of the surrounding districts would crowd on the approach of the enemy.

At there are now no walls to hinder the expansion of cities, and modern rapid transit systems permit of covering great distances quickly and cheaply, modern cities are seen to extend their suburbs like tentacles a long way into the country, deriving from the latter an inexhaustible store of vigor and health. The country used to come to the town; now the town goes out into the country. Moreover, the crowded network of marrow stressts devoid of any trace of verdure is more and more replaced by regular systems of broad and well planned streets, leaving plenty of space for private gardens. In view of the increasing importance

In view of the increasing importance attached to this problem the Exposition of City. Building, organized by the eity of Disseldorf on the Rhine, would seem to be of more than passing interest. The idea of this exposition had been suggested by the decision of the City Counsel to call for a general sompetition for the building of Greater Disseldorf, the outcome of extensive incorporations of nosphoring communities. It may be said that Dusseldorf, the old and quiet town of art and gardons, had, with surprising rapidity, become an inclustrial center of nearly 400,000 inhabitants. It was intended to collisist such plane of modern cut y builders as the contract of th

With its historical and modern town pittures, its models and photographs of remarkable monuments and buildings, old and recest, its reproductions relating to the designing of steets and drainage plants, gas and water supply, the exposition is nothing short of an illustrated history of German towns and is bound especially to appeal to those concerted with the pharmater of modern towns and their manifold tasks from a social, educational and sanitary moint of view.

The Department of City Bullding presents in 37 rooms a number of solutions of town-planning problems. The town of Hamm. Westphalia, illustrates by means of two relief maps corresponding to 1910 and 1916, respectively, the contemplated improvements of its street system entailed by the partial shifting of the river Lippe and the construction of the Lippe cand, the costs of this improvement work are estimated at 87,000,000. A large model illustrates the street improvement recently



Exhibit of the municipal schools of domestic science.



Model of the city of Hamm and its environs.



Suggested plan for a town with plenty of garden space.



Display of a plant that utilizes refuse slag.

THE DUBSELDORF EXPOSITION OF CITY BUILDING

ommenced in the Hansastrasse at Dort-

mund
Another scheme shown at the exposition, which is likely to arouse universal
interest is the contemplated installation of
a network of roads 21 meters (69 feet) in
minimum width, affording a connection as
straight as possible between the various
centers of industry, and dealing with street
car as well as carraige traffic. These
roads are even to be continued beyond the
industrial district proper, as far as Aixlein

car as well as carraige traffic. These roads are even to be continued beyond the industrial district proper, as far as Aksis-Chapelle and Cologne and the Step district. An important department coming under the lead of "Sanitary Arraignments" is that of dramage plants and the purification of swage Hamburg had long been the only German town having a well controlled dramage plant, until in the sixtics of last century the towns of Frankfurt-on-Main, Nictur, Danzig, Berlin and others at last realized the importance of such installations.

Included in the exposition are all the different systems of dramage, many schemes, general and specified, of plants of different dimensions on the muring and different dimensions, mechanical cleaning and setting traiks as well as plants designed on the biological and oxidation processes, speem plants on the Emechanical Companies of the processes, speem plants on the Emechanical with the plants for midutarial works, hospitals, etc.

plants for inclusival works, nospirals, eleA kindred problem is the cleaning of
strevts and the refuse disposal. The divers
ways and mean available in this comstion are most adequately illustrated, thus
affording to incurrent a welcome opportured an interest and at the man in the
travel an interest and the formation of the
travel an interest and the formation of the
monificents known. The city of Dortmonflicents known. The city of Dortmonflicents known the city of Dortmonflicents for some shows an installation
for the collecting and loading of dimester
refuse destined to be transported to some
distance and for the elevaning of distal-bins
on the alternating system. A large-scale
refuse sorting plant connected with agreedtural operation is exhibited by a refuse
utilization compant. Petures and actual
models of refuse destructor plants are
shown by some of the most important
cities of Western Germany and by many
cities of Western Germany and by many
congineering firms.

engineering times.
Commonal and private hygiene, inclusive of the installation of baths, sanitary plants, beating, disinfection, school hygien and other sanitary arrangements, constitute another department. Maps, illustrations and models of widely differing bathing establishments from the simple douche to the large swimning tanks and the most modern achievement, viz. riverside "beaches," are among the more important exhibits of this part of the exposition. The economical and hygienical disposal of the dust of our dwellings has for the general health an importance which cannot be overrated.

Other exhibits of interest are those relating to the destruction of rats and gnais and on the other hand to the protection of numals. The various arrangements for the treatment and prevention of diseasform a special croup showing in a mostcomprehensive manner the management of modern hospitals, as well as the provistion made for the prevention of epidemose and the protection of infants. The department of Cyal Engineering

The department of Civil Engineering comprises plans and models of public and industrial buildings, railways, bridges, etc. The department of Industry finally reviews the development and status of the industry of Western Germany in its various branches and therefore resembles the ordnery industrial slow

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### SCIENTIFIC AMERICAN Founded 1845 NEW YORK, SATURDAY, SEPTEMBER 14, 1912

Fublished by Munn & Co., lucorporated. Charter Allen Munn, President Frederick Converse Beson, Secretary and Treasurer: all at Mi Broadway, New York

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The hidstor is nivers glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this journal is to record accurately simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

HATEVER benefits of a military character may be derived from the may be derived from the recent army maneuvers (and they will doubtless be the operations have had the much desired result of drawing attention forcibly to the necessity for good roads as a part of the system of National defouses. The Army and Vavy Journal states that there was one The Jimy and Vary Journal states that there was one opinion shared unanhousts by Army and National Guard officers who took part in the Connecticut maneuvers. It was that the roads of that State, with the exception of some of the main turnplies, are not what the roads of so old and advanced a State as Con-lecticut should be. We are told that in the event of war and a heavy fall of rain, the side roads would be almost as impussable as the Virginia dirt roads were during the Civil War. The necessity for good roads is emphasized by the fact that the country is hilly; and those of us who have had occasion to travel through the State know that some of the bills are both steep

The defensive maneuvers in Connecticut proved once more that good highways are absolutely necessary for the rapid disposition of troops. Napoleon understood this fact, and his system of military roads is one of the finest monuments left by this soldier-engine is not to the point to say that railroads, which were unknown in Napoleon's day, are available now; for while the railroads are excellent for the conveyance of large bodies of troops quickly over long distances, we must remember that the majority of the movements of troops, especially in tactical movements, must be made over the State and country roads

#### The Gordon Bennett Cup Race

F the Gordon Bennett Cup race taught us any-thing it taught anew the lesson of America's backwardness in aviation. Prizes of ten thousand ar officen thousand dollars had been offered by clubs for a cup defender. The response was discouraging to say the least. Gallaudet made a splendid effort to comply n enn defender with the Aero Club of America's conditions by desig ing a machine which is in every way a credit to American ingenuity, but which sustained a severe accident a few weeks before the race. That a nation of innety million people supposedly possessed of considerable wealth and interested not only in sports but in the most recent developments of mechanics should produce but one Gallaudet is hardly to its credit. But when but one Galanutet is midtly to its credit. But when that nation is more or less in homo bound to live up to the traditions of a langley, who gave the world the first montactiven aeroplane model, and of two Wright brothers, who gave the world the first man-carrying motor-driven flying machine, what can be said in

To France belongs the credit of having displayed the greatest interest, not only in the Gordon Bennett race, but in the industrial side of aviation as well. From the very beginning the Gordon Bennett race has been the very legiming the Gordon Bennett race has been a kind of milestone which marked the progress of French designers. True, in years past the race has been won by Englishman and Americans, but the French really deserve the credit, for, with one exception their machines and their motors carried the pilot to victory. The only formidable connections of Curtiss

in the new historic contest of 1909 were a Rieriot and on Antoinette machine. In 1910 the Bleriot and Ant ofte monopianes were again in evidence, but improved in cre monopanes were again in evidence, but improved in design and equipped with motors of higher power. In 1911 a Nicuport, a "spearinable machine in every way, envised off the honors, "Shis year the Freuchmen ap-peared on the scene will two Departusations of 140 and 100 horse-power, respectively, and a Hanriot of 80 horse-power. In the elimination trials held on July 18th Inst, these three machine developed amazing speed. The 80 horse-power Hantist made 445 kilemeters (80.06 miles) per hour; the 100 horse-power Deperdussin, 104.338 kilometers (102.11 miles) an hour; and the 140 horse-power Peperdustin, piloted by Vedrines, 169.81 kilometers (105.51 miles) an hour. Even the machines of Grahame-White and Hamel are French; for Hamel's noneplane is a true Bieriot and Grahame-White's a Nicuport, for all its English pedigree.

It seems distinctly wrong to credit the man rather than the machine for a Gordon Beanett victory. Without disparaging in the least the courage and the skill out dispuraçing in the least the courage and the sami displayed by the men who pilot monoplanes that cleave the air at one hundred miles an hour, surely it would be more fitting if the designer and manufacturer ware to receive some of the credit. Why should not the rules estipates that each country shall be represented not only by one of its citizens, but by a citizen esabed in a wealthm made in that country? a machine made in that country?

#### A New Parcels Post

T is gratifying to note that at last the Congre before its final adjournment in August, passed almost unanimously an amendment (Section 8) he Post Office Appropriation Bill (Public No. 336) providing for three kinds of parcels post, two of which are to have a weight limit of eleven pounds, and one a weight limit of four ounces, at different rates, to become operative January 1st, 1913.

The present parcels weight limit of four pounds is thus extended to eleven pounds, and conforms with that of several foreign countries. Fourth class mail matter is to embrace all other matter, including farm and fac-tory products, not now embraced in either the first, second or third class, not exceeding eleven pounds, nor larger in size than seventy-two inches in length and girth combined, and not likely to injure in form or kind the person of any postal employee or and the person of any postal employee or damage the mail equipment or other mail matter and not of a character perishable within a period reasonably re-quired for transportation and delivery.

The postal rate of this class is to vary in amount according to the distance the parcel is to go. This. we believe, will be the most vexations and annoying feature of the new plan, and contrary to the purpose of our general postal usage, that is, one rate regardless of the distance traversed. The country outside of the Philippine Islands is to be divided up into units of area thirty miles square, which forms a so-called "posts!" center, and posts! maps or plans are to be put up everywhere showing the location of these numerous centers. The immediate place where the sending party happens to live is called Zone No. 1, and within a radial distance from the center of this zone of 50 mile a package weighing one pound or a fraction of a pound can be sent for five cents and three cents for each excess pound or fraction of ear

Zone No. 2 includes a radial area of 150 miles from the center of Zone No. 1, with a rate of six cents for the first pound or fraction of same and four cents for baned lanoiti

Zone No 3 includes a radial area of 300 miles beyond the center area of No. 1, with a rate of seven cents the first pound or fraction of same and five cents for additional pound or fraction thereof.

Zone No. 4 includes a radial area of 600 miles from the center area of Zone No. 1, with a rate of eight cents for the first pound or fraction thereof and six

courts for the first pound or fraction thereof and six cents for each additional pound or fraction of same. Zone No. 5 includes a radial area of 1,000 miles from the centre area of Zone No. 1, with a exite of nine centra apound or fraction thereof and severe cents for each additional pound or fraction thereof and severe Come No. 6 includes a radial area of 1,400 miles from the centre area of Zone No. 1, with a rate of ten cents

for a pound or fraction thereof and nine ceuts for each additional pound or fraction of same.

Zone No. 7 includes a radial area of 1,800 miles from

the center area of Sone No. 1 with a rate of eleven contr for the first pound or fraction thereof and ten center for each additional pound or fraction of same.

for such additional pound or fraction of spane.

Zone No. 1 housday at the extratory from a fine center of

area of Zone No. 1 hepond the 1,950 miles of Zone No. 1

and any portion of the United Strates, District or Colum
bia, Philippins, Islands, and United Strates Therefore

are true of twelve cents a pound or fraction of a passed

and, twelve cents for such additional pound or fraction.

An appropriation of seven hundred and fifty th dollars was made to defray the cost of special equip-ment, maps, stamps, directories, etc., and the Posts

meral is given addingery to rates analyses to the iggs-state Committee Springers moure entitless recommends trease the rates subf

vide indemnification of eliferies. So said or lost, by insurance or officeries, used for the collection on delivery of the seaso of the article seat, and to fix the repeated. There is provided also a varial free light

parcel pote for delivery on a result free subset of the parcel pote for delivery on a result freen size; another or to the central post sities, likely, for deven spounds for a single parcel with a real cent for the first pound or fraction thereof cent for each additional pound or fraction thereof the first hand of parcels pout as unrestrict territory limits, and is general to the operation weight limit is four owners, said the rates is per ounce or fraction thereof. This rate is as the existing parcels pout

as the existing parents spect.

There is no doubt of the success and values of new parents post legislation, and it will establish vance the interests of all samustacturers throughout

#### The International Congress

N had occasion hast April, at the time of Dr. Eijimman's visit to America, to comment on the biovename for internationalism in science. The subject is once more brought to public attaint on about this time by the meeting of no less than three important international congresses in this control within a period of three or four weeks. Of these, the first in chronological order is the starth congress of the little of the International Association for The International Inter of the International Association for Testing Materials. The purpose of this organization is well brought out in the words of this organization is well brought out in the words of the opening address by Dr. Howe: "The function of the testing engineer is to stand between the public and the manufacturers who supply that public, to test the fitness of those supplies, to measure accurately degree of fitness and to reject unsparingly cura fals their degree of fitness and to reject unequaringly the unfil. He is a guardian of those who traves by sind or sea and of those who live or work in buildings of important size. He is the protector of the material interests of the public, because in the last saulysis all structures and all materials of which they are nucle are for the use and benefit of the public, indi-vidually and collectively, and are paid for directly or interestive to that mubble. indirectly by that public.

"To make this work of the testing engineer more effective, to guard the lives and the interests of the public, it the object of the association's existence. It is an open court in which the public sits in judgment on the various methods of testing."

An event which calls for our very special attention the assembling in Washington and New York of the is the assembling in Washington and New York of the Lighth International Congress of Applied Chemistry, Something of the scope covered by this meeting may be gathered from the fact that the advance copies of the papers to be read fill no less than twenty-four the papers to be read in no less that twenty-new octave volumes. Some of the most significant of these will appear in the pages of our Suppramany. Yet the most important function of such a congress is not the presentation of papers, but rather the opportunity it affords for the direct interchange of ideas between the es attending.

And, thirdly, during the last week of September there will meet in Washington the Fifteenth International Congress on Hygiese and Demography. To say that Congress on Hygiese and Demography. To say that the subjects treated are of vital importance is to use in a literal sense an expression which has become weak-ened by its over-frequent application as a figure of speech. After all, though in the mind of the technical an industry and commerce naturally are appearant, these things are merely means to an end-methods of ministering to our welfare—and it is true for the community as for the individual that health is of greater importance than wealth.

or importance than wealth.

The amount of October also brings two international
congresses to our continent. The Seventh interactional
Day Farming-Compress will be held at Letthirdige.
Alberta, October Jiste to Selts, 1912. In consection with
Street in the Selts of Selts of Selts of Selts
Street Selts of Selts of Selts. th well be held the International Congruen of Farm Wegnals. A feature of the meeting will be an agricul-tional show, comprising exhibits of farm predients groves without Irrigation under a rainfall of not more. than 20 decision per annum. These congruences are exhibiting minimal more attention throughout the world. The the significant part at coloured Septime, atting decision, congrides since designates. Dr. John A. Philiman, pro-cing a Public Agricultural College, its greetings of the significant street of the property of the pro-pagation of the pro-

religion Proposes.

To give vie, se Americane, ao marij metada per la companya de la companya del companya de la companya del companya de la companya del la companya de la companya del la companya de l

The proposed most relievely to the control of the c

The Canadian of Lifebrate.—The president of the Reidel. Bears of Tritle has repointed a departmental committee on best and days to report on the most distinct matched of stowing, leanabling and propelling ships base. The committee favires invester and others to rejust in seguidates by October 1st, 1912.

The only in the bear fully described in the columns of this fournal.

of this journal.

Callier, "Nespane" is Rejected.—It is stated that the solider "Nespane," built for the United States Navy under contract, has been repeated on the ground that ale done not some up to the government specifications. This ship is those which drive the propellers through the medium of a mechanical speed-reduction gear. We underwised that the reduction gear has the state of the machinery; but that the failure to get good all-round results was due to the type of turbine employer.

Castal Open in 1918.—Replying to a communication from the Scoretary of the Board of Harbor Céfinnissiones, Los Aageles, Col. Gosthais states, that every effort is being made to complete the executation and the work on the looks of the Paname cannal by June 59th, 1913. He expects to see the levis' of Gatus, Julies at sightly-show the contract of the College of the

sillow of a year's try-out before the tormal openue, fift-facek Terpelio-defasee Gans.—The return to the six-ind gun as the principal arm for secondary batteries is a notionable feature of naval development in these days. When the "Dreadought" appeared, the secondary batteries were abandoned and dependence was placed upon three-inde and four-inde guns for protection against torpedo-boat attends. Torpedo-boat detroyers, however, have increased to rapidly in size, that a larger gun is necessary to deal with them, and most of the navies have returned to the 6-inch piece; none are using less than the 5-inch or the 4.7 inch.

An Aerial Railway on Mont Blanc.—Acrial railways, which carry their passengers in ears suspended on cables, are the latest departure in the commercislation of the Alpa. One of these unlovely but convenient devices is soon to be installed on Mont Blanc. Starting from Chanonits, at an altitude of 3,000 feet, this will ascend to the Glasier dee Boscons at 7,500 feet, with two intervening stations. It will have a grade of 50 to 60 degrees. The line will finally be extended to the Alguille of Middi, at an altitude of 11,500 feet. The first section is to be completed in 1913 and the extension the following year. The road will be worked with three coubles—the carrier, the tractor and a cable for the brakes. Each carriage will accommodate 24 persons.

Ballewiys in Merocca.—The Franco-German agreemant of last summer conscerning Morocco included a pladge on the part of these countries to construct a railway from Tanagier to Fee. In general there are no enginearing difficulties in the way of railway construction in Morocco and the cost is likely to be small. At present the only railway in the country is a small narrow-space military line now nearing completion along the Atlantic coast from Case Blancy to Rabat. All transportation between the coast and the interior is by carvara and issuagenged; in ted weather, as there are no roads of any are away from the ports. Wheeled vehicles are proticulty inchnown outside of Tangier and Case Blancs, and the principal views interesting the carvara coutes are implicable for sevent magains of the year.

are unfariable for several magnite of the year.

The flarme-Enew-Relievely in Nigeria, recently completed, links Kand, the areas important provide unity center could of the beguine in Lifetin, with Lago, on the context could of the beguine in Africa, with Lago, on the count. Thereinstands in inspector in another is reconstructionally repeat since prior to the spectacy of the malway most of the flatters in make a second countries repeat since prior to the spectacy of the malway most of the flatters in make a strength of the value of the countries of the malway most of the flatters in the countries of the malway most of the flatters in the countries of the malway most of the flatters in the countries of the count

#### Electricity

Telephoning from Norway to Finland.—The Swedes are thinking of laying a telephone cable from Marisholm near Shockholm to Abo across the Finnish Bay. The Norwegana are very interested in this proposition as they could also communicate with Finland by telephone. It remains to be seen what the Russan authorities will say to this. The cost is estimated at one half million Finnish marks.

A 178,000 Velt Transmission Line.—On Big Crock, 275 miles from Los Angeles, a large hydro-electron plant is now being built. Current from this plant will be conducted to Los Angeles at a voltage of between 150,000 and 175,000. The gradual increase of voltage used on transmission lines in California is due to the low hygrosopie conditions of the atmosphere. It is predicted that before long voltages of 200,000 and 250,000 may be employed.

Biver-plainer versus Nickel-plating.—The automobile industry ways Electricity (London) is aboving a tendency to supersede nickel-plating by silver-plating for the bright parts of motor vehicles. Nickel-plating, notwithstanding its hardness, has the disadvantage that when exposed to the weather it becomes coated with a film code hard to remove. Biliver has a whiter color, and is capable of a riches and finer polish. The surface does not peal or corrode, and when tarnished is far more easily polished. The labor cost of plating allver is no greater than for nickel, and as a very thin deposit is sufficient the greater cost of the metal need not correspondingly increase the total cost.

The Selection Cell as an Aid to the Blind.—An instruent recently exhibited at the British Optical Convention enables the blind to use their cars to detect variations of light. There are a pair of high-resistance telephone receivers and a portable box containing a pair of selection; and the two receivers on a balanced Wheatstone bridge system. A clockwork interruptor gives an intermittent current which causes a resping sound in the receiver, louder in that receiver and selentium cell circuit which is influenced by the stronger light. Thus a blind man equipped with the device in which one selentium cell faces toward his right and the other toward his left can seems the difference in light to the two sides, which may give him values guidance in walfing.

The Edison Electric House.—Announcement was made in these columns some time since that Thomas A. Edison was fitting up a house in Llewellyn Park, Now Jessey, with an independent electric lighting plant and a complete equipment of electrical apparatup. The purpose of this house is to demonstrate the advantages of electricity to the farmer who is so isolated, that house is now practically complete and will be one soon to the public. The ourset is generated by a small gasoline segtine which drives a dynamo and the latter in turn stores the current in a hattery of storage cells. The particular novelty of the system lies in the implified means of control, so that the apparatus is rendered absolutely fool-proof and may be operated by inexperienced hands.

Rancies Wireless States in the Arctic Sea.—Russia has for come time evined uponical interest in the Arctic regions, sending out each summer expeditions to Nova-Cambia and other parts of Northwestern Siberia, and taking up with nearwed energy oid plans of a ship connection between Europe and the Estuary of Siberian rivers. Russiao, the well-known Russian travelor (in the company of Kushikne, who at the time was member of Roald Amundsen's expedition) will set out in the spring for Arctic waters, in order, among other things, to find a navigable route to the viver of Western Siberia. In order to improve and safequard Siberian navigation, Russia contemplate the installation of radio-relexquish spittons on the northern coast of the Russian continent, as well as in Nova Zembia and other islands.

Bare Americalum Wises for Colis.—The conductivity of attimination is about 50 per cont of that of amesiade copper. Associationly, an alternation conductor must be accordingly, an alternation conductor must be madescable place in cross sectional area than a copper conductor. It the two are to carry the same amount of current. Aluminium were in always could with a table colide which serves as an insulator. This insulation is encough; sometime to be European manufacturers, to jurnali of using bare aluminium were in the colls of encough; sometime to European manufacturers, to jurnali of a fine were the constructed would be singuistic. For this call of the wire thus constructed would be singuistic. For this call of the wire thus constructed would be singuistic. For this call, the constructed would be singuistic. For this call, the constructed would be sensure affected in the construction of the con

#### Science

Ciudad Perfirio Diaz exists no longer. One result of the new régime in Mexico of interest to geographers la the change of the name of this border town (opposite Eagle Pass, Texas) back to its earlier name, Piedras Negras.

Wireless in Siam.—A powerful radiotelegraphic station is about to be erected at Klong To, near Bangkok. It is expected to maintain communication with Penang, Slingapore, Sagon, Hong Kong, and Manila. The vessels of the Siamose navy are also about to be equipped with wireless.

Prof. Parker and M. McKilsley.—After an unsuccessed attempt to reach the summit of Mt. McKinley, Prof. Herscholl Parker of Columbia University and Belmore H: Brown returned to Scattle on August 28th. It was found impossible to reach a hegalt greater than 20,100 feet in the face of a blinding blizzard and with provisions nearly exhaustic.

A New Telescope for Allegham, Observatory.—A Solienb refractor valued at \$150,000 was recently dedicated at the Allegham, Observatory in the presence of a distinguished company of seismists. It is said that the instrument was paid for by subscriptions collected for the last ten years. Among those who officiated at the dedication were members of the Astronomical and Astrophysical Scowity of America.

Coal Researches in Germany.—The new Kaiser Wilholm seence advancement institution is taking measures to found an institution at Milheum for carrying on research upon coal and kindred subjects, with the co-operation of the large endustries of this region A large part of the expenses for the buildings will be borne by the numerpality of Mulheim. It is also stated, that among recent German enterprises is the founding of an expermental threapounce stabilishment at Berlin.

The Radiology Congress.—The sixth International Congress of Radiology and Electrology is to be held at a Prague, from the 3rd to the 8th of October next, under the patronage of several Ministers. Prof Sixdhasa, restor of the Upper Technical School of Prague, will present on the scenario An exposition of apparatus of various kinds will be one of the features, and the delegates will have an opportunity to visit the Radiological Institute of Vienna and the radium laboratories of Josebinsthal.

Ottest Museum is the World.—Dr. Otto Kummel, head of the East Asiate Department of the Berlin Museum of Ethnology, tells of the oldest museum in the world, in the bulletin of the Société France-Japonans. This museum may be found in the city of Nars, the former capital of Japan. Since its foundation, in 756, it went through all the changes of the Japanese Empire without one sugle addition to its collection. Dr Otto Kümmel is omod the few Europeans who were permitted to viat this museum. It opens its doors but once a vera, on a day in spring, whose a special commutates inspects the collection, and a new list is made out. The miseum contains about 300 articles, which are said to be the most beautiful specimens of decorative work, which have sever been produced by human hand, such as lacquer war, decorative furnities, cannot warv, quantion his fabric, etc. The origin of the majority of the articles is uncertain; some canner Gum China and others from Crus, but most of them appear to be of a more exoste origin. All, however, came of a time pror to the year 750.

The Work of a French Hospital Ship.—A recent counter report describes the remarkable work of the French hospital ship. "Saint Françous d'Assiss." one of two vessels maintained by the Sountes des Courres de Mer to minister to the wants of fishermen of the North Atlantic. The vessel in question cruisses on the North Atlantic. The vessel in question cruisses on the North Gabining grounds and the North Sea. The hospital ship loaves France each spring and follows the French fishermen to the Banks. It carriers a crew of 27 men, including a chaplain and a doetor, and has beds for 30 patients, besides accommodations for shipwrecked salions and patients suffering with minor silments. During the summer it speaks cach fishing vessel on the Banks, without regard to nationality, to ascertain whether its earlies are moved. See for night of themen are given treatment, and when the cases are sufficiently serious are kept on bazed. From time to time the ship pates into St. Fierre to transfer patients to the hospital at that place. During the year 1911 the ship steamed 12,300 marries miles, spoke 1,143 vessels, admitted 70 patients to the hospital, and gave treatment at sea in 420 other cases; hesides picking up 14 shipputs into St. Fierre to transfer patients to the hospital, and gave treatment at sea in 420 other cases; hesides picking up 14 shipputs into the patient of the patient of patients of the hospital service and not the fishing grounds. No charge is made for medical treatment or few medicines, Celand. It has a small subsidy of non the French government, but is mainly dependent upon grivate autoberpitions from year to year.

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### Grenadiers of the Air

### Exploits in Bomb-dropping from Flying Machines

By Major H. Bannerman-Phillips

THE first thing we have to consider in connection with the use of a flying machine or dirigible balloon for dropping projectiles is. Why we should use the ma-chine for dropping them at all, inasmuch as a gun will send them with far more force and effect, and certainly with greater

accuracy of aim.

The answer is that under certain cir cumstances we cannot produce the de-structive or demoralizing effect we restructive or demoralizing effect we require by the aid of artillity, because we can notiber see the objective of our attack nor calculate by map or otherwise its probable position with practical certainty; or because, although located by our air-secuts, it is at such a distance from our factories that a shell will not reach its or because our sarrial districtives much first locate the objects of attack, and having done so, must act on their account with dropped projectiles. assount with uropped projections. They would require to take such action when (A) the objective is out of reach of the artillery, (B) the moral effect of the attack (a stampede of cavalry or transport horses in their lines, for instance) can be achieved with a small expenditure of hand grenades, (C) the purpose of the nand grenades, (c) the heaty demolition of buildings bridges, or stores, by ex-plosion or fire, but these latter are so situated, or so well guarded, as to be inaccessible to men landing from a flyingmachine, and using explosives or other incendiary means at the ground surface, or (D) when the object of attack, say a or (D) when the object of attach, sat a column of troops caught on the march along a causeway or bridge, would get away into safety unless the aerial de-stroyer acted at once, instead of returning or sending word to the artillery.

There are roughly speaking four

of targets or objectives against which the or targets or objectives against which the dropped projectiles might be used with advantage, other things being equal, and four separate types of bomb would be required for use accordingly: 1. Heavy explosive bombs.

- bombs or hand grenade

3. Incendiary projectiles.
4 Aerial projectiles.
It will be convenient, to begin with, if we take each type separately.

#### Heavy Explosive Bombs.

These would be used against such targets as dock yards, ships, railway junctions and termini, turntables, and rolling stock, bridges, postal, telegraph and wireless stations, banks, exchanges, and wireless stations, Drains, excursingers, telephone and sinff offices, War Department and Admiralty buildings, rangefinding bases of forts, and other nervenenters generally. The demolition of these would tend to disorganize traffic (military and commercial) interrupt com munication of orders and information, and thus paralyze the fighting forces of a nation, and bring pressure to bear on the civil authorities by cutting off supplies and starving the population.

For such purposes as these the pro-jectiles must strike the exact spot. Of the actual result of a charge of high exone assume result of a charge of high explosive when merely dropped—not fired from a gun—and exploded on impact, we do not know much as yet, except that the effect, though great, is prohably very local

#### Hand Grenades or Small Bombs.

The second purpose to which dropped bombs would be put would be the attack of troops assembled in masses preparatory to extension or advance in small columns for attack; reserves kept in readiness for action under the shelter of high ground, whose position would be difficult to locate without overhead souting, and against whom distant artillery fire could not therefore be used with certainty of effect; troops marching in columns of route alors

A grenadier was originally a soldier detailed and equipped for throwing hand grenades. He has long been obsolete. Only his name remains to recall his now historic function. It may be that the flying machine will rehabilitate him. Military men have been conducting experiments to ascerrehabilities him. Military men have been consisteing experiments to ascer-tain just inch is the destructive effect of epitories dropped from a height by a flying mechan. In the compaign bombs have been dropped under actual ner conditions. In France, Michelin offered a price for bomb-drop-ing adhievements, which was soon by Leutenant Riley E. Scott, an American. The following article, evittee by a British offer what is a recognized authority on the military was of derhips and corplains, shows how much and how little may be appected of the new-fallowed princidier of the air in the present state of our knowledge.-- HOLTOR.





The type of aerial bomb used by Lieut. Riley E. Scott.



Lieut. Riley E. Scott's bomb-dropping device. Lieut. Scott won the Mishella schie.

defiles and hollow roads out of sight of the enemy, but visible to the airman from above and unable to extend quiddly to either flank, thus forming a hel to overhead fire; transport and animition columns on the march; convoys tions coming up from the be provisions coming up from the case as supply in the enemy's country to the troops fighting at the front, these convoys being too far off to be reached by artillery and too well guarded in front and fianks to be open to attack by mounted and finniss to be open to attack by minutusity troops moving on terms firms; horse-lines, and camps of all arms, the frequent harasament of which by bombs at night would stampede the horses, disturb the well-sarmed rest of tired soldiers, wear them out, demoralize them, and destroy

For these purposes hand grenades small bombs would be sufficient, the s need not be very precise, and a fairly large number could be carried by one flying machine.

So far the experience of the Italians in Tripoli tends to show that the moral and material effect on troops of bomb-dropping from aeroplanes by day is very small. It has even been said that in some cases the bombs did not explode, and that they were picked up and used against the Italians themselves later on. The latter, however, have not given up the idhave been carrying on further tests of the effect of dropped projectiles from dirigibles in Italy and off the coast. Other evidence as to the uses of the small bomb or hand grenade, as thrown from an aeroplane, is scanty and indecisive.

#### Incendiary Projectiles.

Incendiary Projectiles.

These would be long, hollow, metal cylinders, with solid sharp-pointed steel heads, and with a percussion fuse and a bursting charge in the head, behind the steel point, the remainder of the cylinder filled with an incendiary substance or possibly inflammable liquid, which would have deceased to the combette measured by the burn ficroely on being released by the charge. They would be so weighted and so furnished with flanges, answering to the feathers of an arrow, as to insure their the reactions of an arrow, as to insure their falling head-on, without turning over in the air during descent, the object being to penetrate the roof or outer covering of a building, gasometer, oil-tank, or maga-zine, burst the charge inside and start a configration, or to cover a pile of stores or supplies with burning liquid. These would have to be accurately dropped or they would fail to achieve their purpose. Aerial Projectiles.

The fourth class of target would be an enemy's aircraft, aeroplane or dirigible, traveling in all probability very rapidly in mid-air, and changing its altitude and direction from time to time in order to baffle the attacker, who to drop his probaffle the attacker, who to drop his pro-jectile must rise above the object aimed at. There are, of course, projectiles which can be made to overcome the force of gravity and travel horizontally toward the target by their own powers, such as the "merital forpedo" invented by the Swedish officer, Col. Unge, but for the present we are not dealing with any other than dropped projectiles. To desinge or destroy a hostile aircraft by this means the sirman could use an explosive containing either an incendiary m or faild, with time and percussion, or man, with time and percussion, a as to burst after a given number of a or on striking the target. The per-these would have to be very sensiti-the intention in this case would damage by shock of explosion as the case of an aeroplane, or by a of the gas in the structure of a dirig

The Grapping Ivon.

Another class of projectic stitled to
time against bifter sarrytame or displicatiough it was hardly be sensitived.

control with hooks and blades for tearing with hooks and blades for tearing with material of an accopance, or experience the season of the control of the co

The walls of the bomb are perforated and into the holes are inserted peculiarly shaped builtets, which release two or more kaife edges, when they are projected from the bomb either by one or more successive explosions internally or by centrifugal force. The builtets are assumed to fly out in all directions and, acting like sharpans, materially increase the destructive area of the bomb. Further, an explosive may be used to burst the whole bomb and break it up into a number of ripping-and-tearing fragments of metal at any pre-determined time.

Having described the classification of objectives, which we are likely to attack by bomb-dropping or missiles from air-craft, it is as well to state that in all these cases it is understood that before commencing operations the attacker must be sure that his projectiles, if they miss the target, at least will not be dangerous to his own side. The summary of reasons for using the dropped projectile in preference to artillery, shows that usually these operations would take place over the heads of the seneny's troops or in an enemy's country, but in combate in mid-air between sirrest of any kind the rapidly changing positions of the laster might easily bring them both into the region immediately above our own troops or entreachments, and we must be prepayed to cases fro until the

scene of conflict changes to a more suitable six-space.

So far, we have dealt with the dropping of projectiles in connection with the objects to be attained by the process and the kind of bomb or missile to be thrown.

## Hitting the Target.

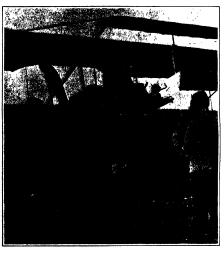
We must now consider the means of securing accuracy in litting the mark simed at, and this is by no means or simple a matter as it would seem at first sight, or as it has frequently been represented in sensational literature.

These are a security of the security of the

First of all, we have to beer in mind, that however bold, and even reobless of an attach story. Bives, the conspants of an antial mechine may be in this interests of their cown, country and their own forces, they can hardly likely to approach the enimy by daylight emphoreved, and an acquitions is of little une—up to the present— —by night. I follows that if they are to deliver, their object being themsley displayed by artifact of the conley, they must keep at such a beight as well give them the best chance of in-



The bemb-dropping apparatus employed by Lieut. Bous quet, who won second place in the Michelin contest.



Lieut, Bousquet sented in his aeroplane in which he competed in the Michelin bomb-dropping contest.



Lieut. Maillefer ready to start on a bomb-dropping flight. The hombs are contained in a trough.

while still able to see clearly what they thomeelves are aiming at. If the enemy also have aircraft, they have to keep a look out for these also, and though the foreness's granters may possibly not fire for fear of injuring their own airmen, on their own armen, on their own armen, on their own and shipped, the would-be spontially also the standard shipped, the would-be spontially also their prepared to become a target chemistives at any momenta arments of their standard shipped and their shipped sould being a many momenta arments.

or prepared to necome a target tomseaves at any moment, a frendly cloud being their only possible cover.

Now it has been proved by actual experience, that buffets from the enemy's rifes struck the acroplanes of the Italian awater in Tripoli at a height of 1,800 feet, and 3,000 feet as been suggested as a attitude, which it would be advisable for an arman to remain at, in presence of the arman and an arman to remain at, in presence of the could not be reached by photopass of the properties, since there are guns which can throw their shell 10,000 feet and more, but taking into consideration the height of 3,000 feet combined with the page, say 35 to 60 miles per hour, of an acceptane, and its constant changes of altrude, it would be an exceedingly efficiell mark to bit, and rapidly to judge distance on, in order to calculate for, and adjust the fuse, to burst the shell at the right blace.

We must realize accordingly, that the bumb dropped from an accoplane or drugstle has presumably to travel some 3,000 feet, as, 1,000 yards, before reaching the object aimed at; that the aircraft is going at a considerable speed, and that the projectile consequently does not drop vertically on to the target, but describes a curve, the shape of which depends on the speed of the machine at the moment the bomb leaves it; that the projectile must therefore be released some time before the machine is vertically above the target, and that bomb-dropping, instead of being a simple matter, requires skill and considerable practice.

Beades this, some special form of sighting and dropping apparatus is advasable, and the bumb-thrower must give his who is attention to his work of the is to achieve accuracy and economize ammunitous he cannot act as pitot in addition. Even so he will find that, everyt in such cases, as strewing hand granders broadcast over a fairly large area, such as a camp, it is exceedingly difficulty to hit the objective and get antisfactory results. So theroughly as this difficulty to hit be objective and get antisfactory results. So theroughly as this difficulty realized by those who have gone into the matter by the beht of the httle actual apperence available, that it is considered, that in order to do any serious derend, that in order to do any serious derend, the modern of figure machines in action and a plentiful supply of bombs.

## The Difficulty of Aiming.

Viewed from this stand point the typical varial dostroyer' of fletion, setting out alone, but balefully efficient, to wresk ships and forte, strew death broadcast among troops, and deemate the population of a hostile township, and then brunging the recalcition enemy to his knees by the threat of continued destruction on the same hines, fades into the limbo of the extravagant and the impossible, but very serious possibilities still remain to be reakoned with, and it is worth our while to go into the question of sighting for the drop of a bomb and the means of release at the right moment.

The stead method of stakek would be to approach the invinenty of the target at high speed and slow down when within range, then hower immediately over it, sight the object through a telescope, drop one or any required number of properties through a special tube in connection with the sighting apparatus—and return to safety as quickly as possible. Such a plan as this might be feasible at night, in easily weather, with a dirigible, which can stop its engines and float novelessly.

It is even remotely possible that it may be achieved with a heavier-than-air machine at some future time; for if we may

## The Flying Boat and Its Possibilities

## How Safe Flying Over Water Has Been Attained and What It Means

By Carl Dienstbach

THE latest flying machine is an aeroplane that floats and runs on water, and that, at the will of the pilot, rises into the air and comes down to water again. This invention has opened new possibilities in flying because the hydro-aeroplane can stop and end its flight wherever a motorboat can be operated, and because it can be used as easily and as extendeely as a motorboat. An aeroplane derives no support from the air unless it is quickly driven shead. It must s'ways start and land dead against the wind, and it needs, therefore, a clear level field of sufficient extent to begin or end its flight. Moreover, it can start and land only on a specially selected flying field. The great skill required to keep the acroplane continuously in the attr makes prolonged flying possible only for very ex-perienced pilots. Even then a landing can be safely made only on a flying field. Pilots who fly at great made only on a using near. Photos who my at great allitudes across country always feel worried lest motor trouble should compel a landing. Even when gliding down from a height a suitable clear level field cannot always be reached. What appears as an inviting meadow from a distance may prove to be a swamp.

Against his will the aviator may be compelled to alight all great risk. In great cross-country aeroplane races machines are often broken and passengers injured when they are thus forced to come down on unsuitable ground. The hydro-neroplane that can alight on the water can come down everywhere and at any moment with perfect safety

## Early Attempts at Flying Over Water.

There are, in fact, so many advantages to be derived by starting and landing on water, that one wonders why the aeroplane was not originally a hydro-aero-The first experimenters did indeed design th pathe The first experimenters un innered design over machine to start and alight on the water. Octave Chanute, who was the first engineer that had a clear conception of the difficulties of flying, urged all experimenters to try their apparatus over water, because permenters to try more apparatus over water, occanies. "The worst that could happen to them there would be a ducking." Prof. Laugley followed the same theory, Mr. Manley, who was on Laugley's machine when twice it fell into the water, after being broken by the mechanical launching apparatus, undoubtedly owes his life to Langlev's foresight. Maxim ran his purely experimental machine, with which he did not attempt any free flying, on a railroad track. Hargrave, Kress and Biériet made their early free flights with motordriven aeroplanes provided with floats and started from water. The only exceptions were Lillenthal and Her-ring, neither of whom built aeropianes in the modern sense, but rather wings which were so light that the

aviator could carry them on his body. Archdescon in Paris also mounted his aeropiane on floats and started it from the water, but his was only a gliding machine without motor or propeller, flown like a kite by towing it with a fast racing motorboat. Apart from all other considerations, the most elementary engineering principles would lead an experimenter to design an plane as a hydro-aeroplane. A machine which has to move ahead before it can be supported in the air is, above all things, a vehicle with horizontal sails.

It was, in fact, a very definite necessity which finally caused Hargrave, Kress and Biériot to abandon the floating planes and to give us the swift aeroplane starting from a monorali with the aid of a catapult and landing on skids on soft ground. The necessity was most clearly illustrated when Glen H. Curtiss, the inventor of the first successful hydro-aeroplane, made his first experiments with an aeroplane mounted on Curtiss had every inducement to experiwith hydro-aeroplanes, and it is no doubt these that the world owes the invention of his useful The flying grounds at Hammondsport, where the but Hammondsport is situated on the shores of Lake Keuka, which would have offered an ideal flying field if it had been possible to start the machine from its surface. Consequently, in the fall of 1908. "June Bug," the first publicly demonstrated successful American aeroplane. was taken from sembled an ordinary catamaran. Although this was a machine that had flown well over land and that far better equipped to get into the air than either the Hargrave, the Kress or the Blériot machine, it could he made to run quite fast on the water, but never fast enough to rise into the air. The reason is not far to seek A speed that may be very fast for a water craft may be too low to start an aeroplane and support it in the air.

## flow a Flying Boat Should be Built.

It is very easy to design a hydro-aeropiane on rong principles. There are two ascending scales of effort that may be made to meet-then the hydro-aero each other—and then it is a failure, however well it may fly from the ground. The first scale is the con-stantly increasing head resistance of the floats in the water, which increases very rapidly with speed, and the second scale is the constantly increasing support of the planes in the air which also increases with the speed, but very much more slowly than the water

resistance. This is due to the fact that what is fast in the water may be slow in the air, and that water resistance and air support both increase with the square of the speed. It is evident that the motor may its utmost power to drive a machine through water with a speed that seems very fast, but that falls a trifle short of sufficiently supporting planes whose lifting power increases with the small squares 4, 9, 16, 25, 36, while the water resistance increases with the large squares such as 64, 81, 100, in spite of the fact that any appreciable lift would take the float partly out of the water and decrease the water resistance in turn. The result is that even a slight reduction of the resistance in water would enable a hydro-aeroplane to fly, which at a speed only a little lower, has prac-tically no lift whatever. Obviously either a more powerful motor must be employed or the water resistance of the floats must be reduced. The four-cylinder motor that drove the first Curtiss aeroplane overland probably could not lift the present Curtiss hydro-aeroplane out of the water.

But the real solution of the problem tion—lay in the design of the floats. This problem had already been partly solved in the hull of the fast smootheat. Naturally, they were taken as models. A new principle was introduced, and that was the principle of the hydroplane, or gliding boat.

The Hydropiane Principle Offers a Solution. The floats themselves had to be made to exert a lifting effort; the speed was increased to raise the floats out of the water by their own action. Thus the wings were enabled to exert their own lifting effect. short, the hydroplane filled the gap between the two scales of effort mentioned. The moment Curtiss had found the proper shape for his flat-bottomed, rectangu-lar-outlined float, the first practical hydro-aeroplane rose from the water.

Curtiss, indeed, was not the first one to make a hydro-aeroplane rise at all. Fabre in France had anticipated him in that, but Curitss gave us the first comparatively perfect machine. With the practical sense he has repeatedly shown, he recognized that one float has less water resistance for the same floating power than two floats, and that one float also makes power taan two noats, and that one float also makes the lateral balance of the floating machine more inde-pendent from the disturbance of the water level by waves than catamaran floats. He prevents his machine from capaciting by small auxiliary floats beneath the wings. He also has so shaped the floats that if by any reason or mistake of the pilot the machine should come down at a steep angle, the upper surface of



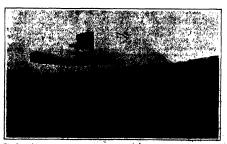
ening's monoplane boat. This is the first monoplane b structed in this country. It was tested on July 25th in a voyage of 52 miles, during which occasional short flights were made.



Lieut. Conneau's hydro-zeroplane in which he made son remarkable flights in France before he came



The Curtiss boat is driven by an 80 horse-power motor. It is 2 3 feet wide, and has a depth of hull about equal to the width. It is 26 feet long,



The Curtiss hydro-nareplane in flight. The operator and p in the hull and are protested from the spray by a collect

The second s

the float will not strike the water and thus overturn ine by the tre t at its great speed.

....

There are at present very many types of hydro-acreplanes. After the floats had been changed to hydros nearly every type of aeropiane was transformed into a hydro-aeroplane simply by mounting it cata-maran-like on two hydroplane floats that took the margal-like on two ingruposians nows that rook the place of the ordinary wheeled running gear. But all these machines experience trouble if the water is rough. The single float type, on the other hand, leaps from wave to wave and start at a light swell even in troubled water. Attempts are being made to make the hydro-seropiane still more like a legitimate water craft by transforming it into a beat with wings. If that is done without impairing its flying qualities, it will certainly be for the better.

Even the best fliers have recently met with so many accidents while flying overland at great altitudes that ordinary men are afraid to take chances. Besides, there ordinary mes are arrent to decrease the contents there was always the necessity of starting from a distant fiying field. As explained in the beginning, the hydrogeneous meaning the content of the starting from the content of the preferably on a float anchored in the river. The shed may be flooriess and the machine float like a boat on the water inside, sheltered from the wind. With its eed and perfect obedience to rudders in the water, the hydro-neroplane may run a long distance to a spot where the water is clear of traffic. It is not too big for a river; whereas the regular aeroplane is much too big for an ordinary road. It may run wherever a uns, and withal the pilot has the pleasure of flying and of moving at high speed.

#### High Flying Not Essential.

Most important of all, the hydro-aeroplane, unlike the land machine, need not fly very high. It is only ssary to remember how even land birds skim the water. Flying is so much easier over water than over water. Flying is so much easier over water than over land because the conditions of the air over water are so totally different. Over water there is no dust, no obstacles to break up the air currents, no de-scending currents or air holes, and no ascending currents. The whole surface of the water is uniform in temperature. It does not heat the air and send it up in an invisible, dangerous whirlpool. In short, it may be said that near the water's surface the air is nearly as perfect for flying as over the land at great stitudes.

The whole surface of the water is one immense flying field, so that the hydro-aeroplane's pilot may down and continue at a fast clip on the water and go up again whenever he pleases. Hence, even more or less in-experienced fliers, who have only learned to jump a few feet from the ground, may still take long excursions in a hydro-aeroplane. Too much, however, must not be expected from present hydro-neroplanes. Obviously the than even the skids of an aeroplane. Skids are used only for a short run, but floats are required for long

Recrybody knows that there is much wind ver water. The planes must be pointed differently into the wind while running on the water than the floats are pointed in the water. This is something for designers to consider. The planes should be as adjustable as the sails of a yacht. But if a hydro-aeroplane is designed always to head automatically into the relative wind, like a weathervane, it will have no more to fear from squalls and storms than a motor-boat. It should also be built so strong that it will not be broken by a fall into the water from a moderate altitude, and its weight should be so distributed that in the water is will always regain an even keel and right itself again, no matter in what position it drops. If that is attained and the construction is strong, the hydro-seroplane will be as safe as a dirigible (which it resembles because of its nower of flotation). It may be upset, but will always right itself again automatically upon uching the water and get into position to continue

## The Coming French Maneuvers

The Cogning French Maneuvers
THE consign maneuvers of the French army will see
The application of the new ideas regarding aeroplanes and atractics which were decided upon by the
Var Department. Each of the opponents in the maneuvers will be provided with an airchilp as well as a
certain number of secrophanes, and two sirrchips will be
held in research. To each purry are allotted four feets
of aeroplanes or units of six seroplanes such, making
24 in all, or 48 for the entire army. Each feet is
commanded by its offices. Andie from this there will
be a number of seroplanes put in service for artillery
obseryations. On the whole, this year's programme
is meash more extensive than last year's, and the seroplanes will be better organized as to supplies and reis much more extensive than last year's, and the acco-planes will be better organised as to supplies and re-pairs. For this first time there will be made an experi-ment in the use of aeroplanes for escrebing for wound-ed upon the battledeld, and Dr. Beymond, who is among te, is in charge of this work.

Alekanie i na manie

## Corresvondence

The editors are not responsible for statements made in the correspondence column. Anonymous communica-tions cannot be considered, but the names of correspondents will be withheld when so desired |

## Nitrocellulose and Wood

To the Editor of the SCIENTIFIC AMERICAN.
Under date of August 17th, 1912, you published an

rticle that contained the statement that introcellulose olutions used as a varnish did not adhere well to wood I have had ten years' experience in the use of materials d as varnish, and I know of nothing in this line that will adhere better.

About twenty years ago Mr. Goldsmith of the American Lead Penoil Company patented the idea of using nitrocellulose solution for finishing peneils. The idea was of great value, and Mr. Goldsmith successfully defended his patent, which is now expired

Many hundreds of barrels of nitrocellulose soluti are annually manufactured and sold for use on wood by the concern which I represent. I am not seeking any free advertising, and my statements are merely in the interests of accurate information. There are many users of nitrocellulose solutions who well know that the statement that it will not adhere well to wood is macourate.

Frank P. Davis ocurate. New York city.

## Futility of Dredging the Mississippi River

Editor of the SCIENTIFIC AMERICAN

In your issue July 13th, p. 23, reference is made to the prospective use of the Panama canal plant upon the levee system of the Mississippi River "This would at once serve the double purpose of increasing the flo capacity of the river,"

Presuming that the flood capacity increase means the sepening of the river-hed and not the elevating of the height of the crown of the levees, I would state that in St. Paul, several years ago, a sand embankment was made from sand dredged from the river-bed of the Mississippi. How many hundreds of thousands of cube yards were removed from the river-hed and piled upon the banks I do not know; but if I am correctly informed, yards were reasonable the banks I do not know; but if I am conrece, the banks I do not know; but if I am conrece, the hard sucked out the sand, like the muchly cursed Raven in Ingoldsby, "was not have out." as far as increasing its depth was "see you the suckey out." one penny the worse," as far as increasing its depth was concerned, and yet enough sand certainly was taken out to float the Mauretania in the displacement, and

Prof. Pinehot estimated that each year 400,000,000 tons of surface abrasion, call it sult, finds its way into the river, which, as it drifts along, helps to fill up a pot or two here and there.

[ark Twain, who knew the river quite well, and as a

pilot had need to, remarked that dredging the Mississippi and keeping it dredged would be accomplished coeval with the time when Hades froze over. An indefinite proposition as to the fixedness of time and eloquently essive of a negative result.

CHARLES CRISTADORO

## A Defect in Our Patent System

To the Editor of the SCIENTIFIC AMERICAN What seems to some a defect in the patent system appears to have been overlooked by Congressman Oldappears to have been overtooked by Congressman Off-field and other recent investigators. I say defect in the patont system, because while the defect appears in the procedure before the Patent Office, no remedy is sug-gested except through the change in the law itself.

I refer to the practice, that permits the issue of patent with claims dominating a prior patent without the prior patentee's having been afforded an opportunity of contesting the question of priority with the later patentee.

This condition of affairs is found, when A issues a patent on limited claims, and B in an application pending concurrently with A's or filed subsequently to the issue of A's patent secures the issue of his patent with claims broader than A's. Suppose for instance, A shows one specific form of a generic invention and issues his patent on claims specific to his form. B then, after the issue of A's patent files his application for patent for a different specific form of the same generic invention and different specific form of the same generic mventon and issues hip statest subsequently to A's on broad claims for the generic favention by making cash to the comple-tion of his invention prior to the filling date of A's appli-cation. B may delay the issue of his patent so long as to defeat A's light to a resisue or A may in other ways fail of reissee rights. How shall it be remodied? Possibly or reasons rights. Towe shall be remodued? Posterly by providing descala resistance privilege to A under the circumstances and by requiring, on the allowance of broad claims to B, that the patentee A, shall be notified and given: the opportunity of filing release application containing the broad claims. Such notice might secure one of two results. In the first place, the patentee might assert a claim to the invention and file proper papers toward the enforcement of his claim. On the other

hand, he might be in possession of some facts, which would show that the invention covered in the claims suggested and allowed to the subsequent applicant were not patentable, and in this way, the action might not only result in preventing an injury to a patentee, but, might also be of service to the public in preventing the issue of a patent for claims which were not, in fact,

Possibly some better remedy can be suggested. not feel capable of suggesting the full remedy, but only call attention to something that seems to demand remedial action. AN INTERESTED READER.

In the case referred to, it appears that each inventor got what he claimed. Presumably each claimed what he inverted, and so got all that he deserved —EDITOR.

#### Some Obstacles in the Way of Converting the Sahara Desert into a Sea

To the Editor of the SCIENTIFIC AMERICAN

The idea of flooding 250,000 square miles of Sahara through a canal from the Mediterranean has some interthrough a value from the way that this area has 6,969,600,-000,000 square feet. There are 525,600 minutes in a year. To put one foot of water over this surface in a year would require the canal to carry a little over 13,-200,000 cubic feet of water per minute. As the evaporation in Sahara would probably not be less than five feet per annum the canal would have to carry 60,000,000 feet per minute to provide for this evaporation. A canal having a body of water 100 feet wide and 25 feet deep would provide for this if the flow was five miles per hour. but five miles per hour for an average would make a very swift stream in the center Hence, the canal would have to be about three times as wide to prevent the banks from being washed away

So far we have only provided for evaporation. To fill So far we have only provided for evaporation. To his the 250,000 square miles to a depth of 200 feet in forty years would require a canal of twee the size or about 600 feet wide—If it were to be filled in less time it would ry to have the canal still larger. Of course on necessary to nave the canal still larger. Of course the whole 250,000 square miles would not be covered at once, and consequently the evaporation would not be so great for several years, but the sands of Sahara are probably pretty thirsty and would probably absorb a good deal of water before any surface of consequence could be

But there is another view of the matter that is inte If the surface of Sahara is 200 feet below the ocean, then the lower parts of it might be filled to the depth of 100 feet and the remaining 100 feet be used as a fall to obtain water power. Assuming that 100,000 square miles would be covered in this way the canal would be required to carry 5,280,000 cubic feet of water per minute to balance evaporation. This quantity water falling 100 feet would give approximately 1,000,000 horse-power. Assuming 50 per cent efficiency, 500,000 horse-power might be useful when sent over wires at about 100,000 volts. An inland sea of 100,000 square miles would probably be sufficient for ordinary purposes. But is the Sahara Desert as low as this, and is it possible to get any such thing? Chicago, Ill

## A Mathematical Card Trick

the Editor of SCIENTIFIC AMERICAN

The following is an old and interesting mathematical ard trick, and perhaps some of your readers can explain why it works out

why it works out From a pack of playing cards take out the jacks, queens and kings, leaving thus 40 cards. Now lay them face upward in the following order

 use upward in the following order
 CDiamonds
 1
 2
 3
 4
 5
 6
 7
 8
 9
 10

 (Hearts)
 10
 1
 2
 3
 4
 5
 6
 7
 8
 9

 (Spades)
 9
 10
 1
 2
 3
 4
 5
 6
 7
 8

 (Clubs)
 8
 9
 10
 1
 2
 3
 4
 5
 6
 7
 8

 Noxt pick up the cards, one at a time, and lay them in

a pile face downward, beginning from the right upper corner (10 of diamonds) downward to the 7 of clubs; follow with the next line to the left (9 of diamonds, 8 of hearts, etc.) and so on to the last card at the left lower corner (8 of clubs) Now spread the cards again, face downward, in 4 rows of 10 cards each, from left to right beginning with the eard at the top of the pack (8 of clubs). The eards are now ready for performing the trick which consists in guessing the exact location of any of the eards, at the request of the spectators.

To work it out multiply the number representing the

value of the card called for by 4 and add 3 for hearts, 6 for spades and 9 for clubs (nothing for diamonds). For instance, suppose the 2 of damonds is called; 2×4 equal 8. The eighth eard (counting from left to right, first upper row) is the 2 of diamonds. The 6 of hearts would be found thus: 6×4 equal 24, plus 3 equal 27; the 27th card, i. e., the 7th card in the third row should be the 6 of hearts, and so on. When the product plus the number added exceeds 40, count the excess from the first upper row again; for instance, the 9 of clubs should be 9×4 equal 36, plus 9 equal 45 (excess 5) the 5th card in the first row is the right card. row is the right card.

Mayagues, Porto Rico. WILLIAM FALDS.

## Fig. 1. - The cylinder blanks as they

ONE of the most interesting aftermonns, if not the most interesting, that I spent in Parls was when I went through the well-cupinged factory where the wonderful rotary flome engine is made Monsieur Neguin himself, the designer of the motor, acted as my guide so you may be sure that I saw about everything there was to be seen.

The spectacularly rapid development of

The spectacularly rapid development of the aeroplane is due, far more than even those in close touch with aeronautic affairs seem to appreciate, not so much to the improvement of the aeroplane itself as to the perfection of the motive power

In July, 1909, Bleriot flew the English Channel, and his fest was heralded as nimost miraculous. And, indeed, it was, as those can appreciate who are acquainted with the motor he employed for his epoch-making flight—a three-cylinder fair, which developed not over twenty-five horse-power at the most. I learned to fly at Pau, France, with the same type of motor and was forced to try three before I could get one which would remain cool long enough to carry me the short distance required in the flights for a pilot's license. And when I landed, the temperature of my engine was nearer that of an overstove than that of an efficient internal combustion motor. The Biériot monoplane of to-day is practically the same as the one used in that memorable first Channel flight, and yet is capable of sustained operation across country as well as ideal for high-altitude work. ros, was made with this machine. In the Boston Globe's Tri-state aeroplane I won the \$10,000 prize by flying one hundred and eighty-six miles in three hours and six minutes, and when I landed my motor was in nearly as good condition as

Why this difference between the monoplane with which Biferiot was just able to fly the Channel, and the modern efficient plane of ro-day? One word fells the story— —the motor. To be sure, wishors are more during in 1912 than they were in 1908, but plannelly, this is due to the fact that they know their mechanical birds are more dependable fan formerly; and this dependability is largely due to the improvement in the motive power.

If I were naked to give my opinion of the Gnome motor in a few words as possible, I should say that it was theoretically one of the worst designed motors imaginate, and practically the most reliable acceptance winder. I know of I should have to add as a qualification that I assume it receives the constant attention of expert mechanics. As I had two seventy horse-power, seven-cylinder Gnomes with my Bicriot monoplane, and probably flew more miles last season with a Gnome motor than any other aviator in America. I speak from experience, If an expert engineer on gasoline engines were asked to examine a Gnome motor, one having

## The Gnome Rotary Engine

The Airman's Chief Reliance

By Earle L. Ovington, Consulting Engineer, Licensed Aviator

Wonderful records for speed and endurance, for high-flying and passenger-carrying have been made. They testfy mutely to the efficient motors upon which the record breakers reliad. Almost all of the more remarkable feats of the aeroplane hase been achieved with the rotary motor—a type originally sinemed in this country but carried to perfection in France. In this existing with the states, written by a man who is not merely and additionally the content of the most of the states with the former motor and the Massachusetts Institute of Technology, we are told what the Grown engine means to the mon in the air and to what its assonishing success to due—EDITOM.



Fig. 8.—Flanging a cylinder in seven and one-half minutes; the previous tool took nearly three hours.

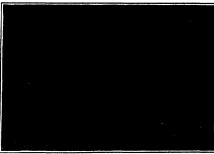


Fig. 4. - The process of fluishing the cylinder head requires frequent regrinding



Fig. 5.—Grinding process in finishing, where a mirror-like surface is obtained in the bere of a cylinder.



Fig. 2.—Pirst process of working the heavy cylinder blank—roughing out the bore.

no previous knowledge whatever of the mechanism, he would unquestionably pronounce it an impractical, though a highly ingenious construction. In fact, when the first Gnome shot meteorically into the limelight, this was the universal opinion in engineering circles.

You can hold a Gnome pistou in one hand and break a piece from it with the thumb and finger of the other, the walls are so fragile. The valves are so this not so large that you never cease to wonder why they are not warped out of shape before they have been in service three minutes. Litarily, no pleton rings are used, the "obturateurs" which serve the purpose being simply rings of thin sheet bronze, one to each cylinder. Compression in a Gnome is noticeable by its absence and, "of course," says the engineer upon first examining the engine, "the spark plugs would be readered useless as soon as the motor attained its speed." This is what might be expected with the plugs situated in the cylinder heads of a revolving motor where a gallon of oil goes past them every hour of operation, but there is seldom plug trouble. Yet, withal, the Gnome motor is, in my opinion, in a class by itself where the greatest power for the least weight, together with reliability, is desired.

The Gnome is a very expensive motor to buy and to keep up. My seventy horse-power engines cost me \$4,000 each, and I paid three French mechanics fancy salaries to act as trained nurses for the delicate mechanisms. Bet I had the Nejhest power motors for their weight, and that is related for exhibition work. At the Chicago meet, I won the price of a motor in a couple of days' flying. Yes, I will seknowledge the Gnome is expensive to buy, expensive in upkeep and delicate in construction, but for speed and reliability. I have not found its equal.
"How can a delicate motor be reliable?"

"How can a delicate motor be reliable?" you say, and id on not biam, you for ask-ing, for such a statement seems paradoxical. Nevertheless, it is a fact. Let me explain. Usually every fifteen hours of running, and at most every twenty, my mechanics want through the interesting philosom of separating every single component part of my motor one from the other. The valres were reground and retimed, new valve springs were inserted, the tappet rods were adjusted, and the tappet rods were adjusted, and the the part of my motor of a rigid inspection. The Genome, in common with most rotary motors, uses cartor oil as a labricant, hence at pack cleaning great quantities of carbox were removed. I claim that any singles requiring such attention may rightly be torsaed "delicate." How far would you get hin an stumbelle if you had to take the entire senties to pieces single estimate the part of the whole motor veries ditions of the street relation of services.

twenty hours of service?
Set-end this is the important part to the sylator who depends upon speed and

THE REPORT OF THE PARTY OF THE

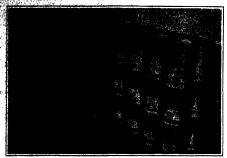


Fig. 7.—A pile of completed cylinders from solid bars of steel at the Gnome facts



Fig. 8. - View picturing the finishing of the hollow crankshaft of a Gnome motor.

exhibition work for his remuneration-my Gnome motors never stopped while I was in the sir, unless I pur-

tors never stopped without was in the sir, timess I pur-possly cut off the ignition, and—another consideration of equal importance—I had great power combined with light weight, which usually brought me in either the winner, or at least second man, in a race where perhaps the prize was \$1,000 for a fifteen-minute flig made one hundred and seven flights in my Blériot and never broke a single stick in the machine, and I attribute my suca largely to the fact that my motor d me in the air. I had several bad smarkes, but in every case without exception these smaskes were due to motor trouble, and they occurred when I flew a machine other than my faithful Blériot "Drugon Fly," which was given careful scrutiny by my

The Gnome factory, situated on the outskirts of Paris, is not a large one, but it is unusually well-equipped and up-to-theminute in operation. The very latest type of machinery is employed throughout, and wherever possible it is automatic to the last degree. This employment of automatic machinery of the latest pattern is not as common in France as in this country, and even in some European countries, for the French are proud of their handwork. Incidentally, the greater part of the automatic equipment is made in America-the home of the automatic machine tools. If we judge the character of a factory by the weight of its output, then we would have to acknowledge that the Gnome establishment turns out steel shavings, with motors as a by-product, since for every pound of motor manufa there are over ten pounds of shavings.

There is not a single cust piece in the Gnome engine—every part is cut from a drop forging or from the solid metal. Fig. 1 gives an idea of the cylinder blanks as they come from the drop forging hammers. Each blank weighs in the rough no less than eighty-one pounds. This weight is reduced to four and one half pounds to make a cylinder for the lightest motor in existence, for its power—Fig. 2 shows

the first process of working the heavy cylinder blank
—roughing out the bore. Fig 3 depicts what was to

Fig. 6. —Workmanlike job of welding the bushing into the side of the cylinder head by autogenous pro

me the most interesting process of all-that of flanging the most interesting process of all—that of nang-ing the cylinders. Thirteen cutters, working simul-taneously, produce the most highly finished and most perfectly formed flanges I ever saw on a gasoline cu-

You cannot look at the Gnome motor, and be gine. interested in engine design at all, without being lost in admiration of the beautiful machine work as exemplified in the finne construction of the cylinders. This

flanging tool, Monsieur Seguin explained to me, takes just seven and one half minntes to complete its work on a cylinder, while its predecessor required almost three hours for the same job. "And," he added with a twinkle in his eye, "we had to go to Berlin for It—you Americans have nothing so rapid in operation." I reto go to 164th for 11—you Americans have nothing so rapid in operation." I replied that I noticed that most of his machine tools hore the name plates of American manufacturers, which indicated that if we could not make cylinders as rapidly as the Germans, we excluded. celled in almost everything else. Fig. 4 illustrates the finishing process of the cylinder head. The exhaust valve screws into the end of the cylinder and may be removed, complete with its sent, for the frequent regrinding necessary to efficient operation in Fig. 5 the grinding process is shown. After the cylinders are ground with the greatest care and accuracy, the fluishing is carried still further by wear ing-in the cylinder with an actual piston carrying an "obturateur". No pains are spared to obtain the mirror-like surface noticeable when one examines the bore of a Guome cylinder

The bushing into which the spark plug screws is not integral with the cylinder as in a cast construction, but is into the side of the cylinder head by into the side of the cylinder head hymens of the nutogenous process as shown in Fig. 6. An unusually workmanithjob is the result A pile of completed cylinders is shown in Fig. 7. This engraving indicates plainly the enormous size of the hole in the cylinder head into which the complete exhaust valve is screwed. It is also evident that this construction en-

soles the inlet valves to be easily removed, since these screw into the piston head. Buth inlet and exhaust



d motor, its fuel and oil to



Fig. 10. - Method of testing at the Gnome factory. The completed meter in full movement on a trial truck.

## Studying the Flying Machine in the Laboratory

## Recent Progress in Experimental Aerodynamics

By A. F. Zahm, Ph.D.

B ROADLY stated, the men of the almeteenth century under the continuent the essential fretures of dynamic acrial transportation, and demonstrated its feasibility, but held to the twentieth century the articleon labelly the commercial prescribed little. The described in the science many constitutes are considered and the commercial present the state of the control of the control

The developments of acrodynamics during the nine teach century are of practical rather than philosophical interest. They turnish approximate laws and rough data for the engineer rather than explanations of phenomens through those intimate and fundamental relations so important to the mathematical physicist. The selence of fluid dynamics must disclose not only the resultant effect on a body funnersed in a metium having relative motion with it, but more especially the portimate cause of such effect, as determined by the velocity and stress at each point of the medium, both borhood. The experimental investigation, however, of the velocity and stress of the all at all plaints about a model, though initiated in the inheteenth century, was, for therough prosecution, left over to the

for thorough prosecution, left over to the succeeding one.

And now the nuclent practice of mov

And now the ancient practice of mov-ing the model through the air, so popular with Newton, Robins and the long line of ploneers down to the culmination of the researches of Lillenthal and Langley. was largely superseded by the practice, introduced by Phillips and Maxim, of holding the model fixed in a uniform airstream where it can be studied by station ary instruments. The uniform current is commonly produced by drawing air through a large tube or wind-tunnel by of a suction fan drivable at various means of a suction ran arrange at various aspects from five to fifty or more miles per hour. The usual method of eliminating swirls and irregularities of speed is to pass the air through a sheet metal "honeycomb" at the front end, and to keep the suction fan running at constant speed. In shape, the tunnel may very well be a cylinder determinated by streamline cones, the whole raised well above the floor. If the cones be so formed as to eliminate eddies, they obviously also enhance the economy of the circulation.

Assuming, therefore, a uniform current available, we may consider the means and results of various determinations of the velocity and stress in the medium, both at the surface of immersed models and at various distances away

The very ingenious method of mapping at all points of an air-stream the com-plete velocity of the fluid, that is its instantaneous speed and direction, by intermittent photography of floating particles, was introduced by Prof Marcy From the hollow teeth of a comb held squarely across the current, smoke streams one fourth inch in diameter and of a like distance apart were emitted in confinuous flow extending through all the region about the model to be studied. These numerous streams showed the direction of numerous screams showed the direction of flow in all places except where they were broken into eddies and promisenously in-termingled. They also indicated approxi-mately the speed of flow, being crowded together where the current was swifter and expanded where it was slower. In special cases the speed was still better portrayed by causing the comb to vibrate ten times per second transversely to the current, thus giving each small stream a way flow whose speed everywhere was indicated by the number of waves per unit of length. The method is most in-structive and would be much enhanced in value if the streams could be made to remain clearly defined and separate for, As under detailed and unrelated accounts of motion endodynamic laborations have from time to time in current literature disclosed the equipment and modified activity of them instituted in the time of the control of t

say, two yards length of flow, instead of two feet or less, as usually happens.

Marcy's photographs confirm and illustrate most impressively the point-pressure and velocity indicated by theory for all the region about a model immersed in the current. In all cases of normal impact there is a point of maximum pressure and minimum speed graphically portrayed by the broadening of the smoke

The pressure-tube anemometer of Dr. Zahm.



'Marey's photographs of the air streams under varying conditions.



The suction blower at the end of Elffel's wind tunnel, driven by a 50 horse-power electric motor.

streams. About the sides of a model are regions where the stream lines crowd together, manifesting increased speed and lesened pressure. At the rear of the model, if of easy shape, the lines broaden again, showing faceressed pressure and slower speed; while if the model to of binth form, the mode streams portray a confused and tumultuous wake. When the stream passes we take the plane or arched surface, it may deviate so violently as to exhibit an sisatic and undinatory movement about the model, an undustory wake, and a pressure of pulsating intensity from point to point along the line of flow. A like effect is observed about normal planes and solid surfaces of bintf outline. In-deed, the manifestations of Marcy's diagrams are so comprehensive and picturesque as to suggest that directly and present the character of the dynamic investigations where the character of the

dynamic investigations where the character of the movement of the find is not perfectly well known. A work of equal or greater importance, at least for applied science, is the determination of the find stress at every point. The point stress on any element of surface has two components; one celled friction, or shearing stress, parallel to the surface, the other called pressure, or normal stress, and perpendicular to the surface. Summing these point forces all over the model gives their resultant effect tending to translate or rotate it. So important, indeed, is the separate determination of these elements of force that it may be said to constitute, sings with the delineation of the stream-

line velocity, the characteristic merit of twentieth century investigations in experi-

mental aerodynamics.

As yet no adequate instrument for disclosing directly the point friction at each of the fluid stream, whether in its depth or where it glides along the model's surface, has been employed, if indeed so much as devised or suggested. Still the friction of air, flowing smoothly at low speeds, has been determined indirectly by many physicists, and the surface friction at fairly high speeds has been found by a few students of aerodynamics. The pres ent writer in 1902-03, by suspending a thin board edgewise in a uniform stream of air, determined the friction on the face of various materials, in a manner resembling that of Froude's experiments water; Francke in 1907 obtained like results by allowing thin blades to swing gewise through the air suspended from heavy pendulum sharpened to offer slight resistance; and Fuhrmann found the friction on torpede-shaped models suspended in a wind tunnel, by subtracting pended in a wind tunnel, by subtracting from their total resistance the resultant pressure obtained by the manometric method presently to be considered The point-friction of air flowing in uni-

form and unconstrained current along thin smooth boards two feet wide and of various lengths and coatings was found in experiments to diminish as the pow 0.07 of the length of surface, and to increase as the power 1.85 of the speed. The magnitude of the friction was practically the same for all continue of the ard, whether glossy, dead or sticky, pro vided they were not rough or uneven. For rough surfaces, such as that of coarse buckram, the friction varied as the square of the current speed. On smooth two-edge pressure and friction were about equal.

They were also of like magnitude on hullforms of least resistance, and on inclined planes meeting the current at an angle of tion per square foot on any rectangular blowing uniformly at ten feet per second. is 0,00050 pound, and for any other speed and length of surface can be calcu and reagant with the foregoing relations.

A table so computed for a great variety
of speeds and lengths of surface was published by the Philosophical Se Washington in June, 1968.

The pressure intensity should be explored both in the interior of the current and where it flows along the surface of h



## SCIENTIFIC AMERICAN

ndel. For the first region no very effective ment has been developed, though Drs. Plans and ti invented a device which approximately gives the velocity and pressure at any point in the cu-away from the model. The point pressure over odel's surface is very easily measured by trans-in through a hole in the surface, thence to a ion through a note in the surface, toward or a thenty delicate pressure rage. The writer devised this wind tunnel experiments ten years ago a pres-gange graduated to millionths of an atmosphere, usually read to one ten-millionth. This was apto studying the pressure distribution over solid s immersed in the wind current. Many experialists use as a pressure gage an inclined glass having a column of colored alcohol and graduated eters of water, or approximately to sandth of an atmosphere, and usually read to fractional parts of a graduation. As a rule, of course, only the difference of pressure between the unchecked part of the current and each point of the disturbed part about the model has to be measured, so that the instru-ment need only be an accurate differential gage.

A Company

The manometric method just described has of recent years figured in a great number of important investigations. First used in the nipoties, in a pioneer way, by Frainger and Vogt, by Prof. Nipher, and by Mr. Dines. if was next employed at the beginning of this century in the elaborate investigations of Drs. Final and Soldati of Milan, to reveal the pressure distribution over in-elined plates, both arched and plane, also spheres, cylinder and spindle forms. It has been since used in the eareful and accurate measurements of Stanton in Eng-land, Prandtl in Germany, and Effel in Paris, not to mention various others. The resultant pressure so ob-tained for normal impact was found to agree satisfactorily with that given by an aerodynamic balance in which the wind force on the model was measured directly by equilibration against a known force, usually

weight or spring tension.

The results of numerous experiments on normal impact, made in these various laboratories, exhibit a general uniformity of characteristic features. Calling a the density, o the velocity of the sir, all the measur p the density, v he velocity or the air, all the measurements disclose a maximum pressure equal to  $pv^2/2$  at the front center of the exposed plate, a more and more rapidly waning pressure toward the front edges, and a practically uniform pressure over the back, varying indeed with the shape, but bearing for various plates no fixed relation to the front pressure. All show that in air of any given uniform speed

and density the pressure intens-ity is practically the same at all similar points of similar plates whatever their size, beyond a square yard, and hence that the resultant pressure is substantially proportional to their area. for dissimilar shapes mean pressure is shown to be as much as fifty or sixty per cent greater on elongated plates than on square ones of the same area All experiments, of course, show that the resistance varies direct ly as the density and square of the velocity of the air. As to absolute magnitude, there is not such close concordance, but the most accurate measurements give for a foot square blade, at nor-mal air density, a resistance not far from 0.008V, in which V the velocity in miles per hour.

All measurements on inclined plates likewise accord in some

important general disclosures. They show that oblique flat plates have sundry properties common to oblique concave ones, and also certain marked differences, Both kinds encounter more resistance when of closgated form and set long edge foremost; both manifest a varying pressure, distribution on the face, and a vary-ing suction on the back, usually of greatest intendity near the front edge; both exhibit feebler pressure and suction near their lateral edges, owing to the lat-eral escape of sir. Aut fat plates have a resultant pressure whose magnitude at small angles of incidence increases directly as the angle, and whose position travels forward with increasing obliquity; while arched plates have a resultant whose magnitude varies in no simple manner with the obliquity, and whose position retreats as the small angles of incidence diminish, wherefore such forms tend to dive preceptitately. Figit varying pressure distribution on the face, and a vary wherefore such forms tend to dive precipitately. Flat

A Same

inclined plates are less efficient carriers than arched ; they also leave behind a tumultuous wake, entailing loss of power, while arched ones deflect the air-stream smoothly and leave an unruffled, though doubt-less an undulatory, wake For this reason good arched forms require less propulsive force for a given life excellent designs carry ten to fifteen pounds of weight per pound of thrust.

The measurements made on elements of hulls and framing of air craft have shown that these also can shaped as to reduce the resistance in a like A stream-line hull of torpedo form can be made to meet a resistance of less than one tenth, probably less than one fifteenth, that of its major circle. The same may be said of the resistance of sharp stream-line posts and rods as compared with their major sections taken squarely to the wind. The tendency in designing fast air craft is, therefore, to give stream-line shapes to all exposed elements, and to encase all parts that need not be exposed, or that do not admit of sharpening. But the practice of polishing to eliminate friction seems futile, since a glossy surface has

inate friction seems runne, since a gross, surface are the same friction as a dead one, other things equal. As the prescribed limits of this article have now been exceeded, nothing can be said of recent investiga-

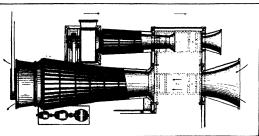


The hull of least resistance

tions on propellers, and on shapes and devices to insure the stability and steadiness of air craft. It is, how-ever, worth remarking that the ablest designers to-day eagerly study the investigations made in the great acro nautical laboratories, and, even if they do not engage in such work, as did their predecessors up to the advent in mon work, as du their predecessors up to the advent of public flying, they promptly turn it to profit, realiz-ing that the adequate test of an aerodynamic model, besides being easy and economical, furnishes a secure basis for predicating the performance of a full-size

#### Russian Bast and Its Uses

R USSIAN bast is the trade name given to the fibrous



Plan of the Eiffel aerodynamic laboratory. ers at the expe

The large and small wind tunnels are shown side by side. Their diam

2 and 1 meter, respectively.

europea). This tree abounds in the forests of Europe and finds its best development principally in the western central provinces of Russia. It is very closely related to the American linden or basswood (Tilia ericana), and is a favorite for planting in parks and along streets, both in Europe and in this country. The pean linden is remarkable for the abundance and fine quality of fiber it contains in the inner bark. Enormous quantities of this bast fiber are gathered very year and exported. In fact, it constitutes one of be most considerable by-products of the forests in entral Europe

Stripping the bark from the trees lasts middle of May to the middle of June. This is the period when the bark is most easily removed from the stems and branches. When the bark is whole it is atems and branches. When the bark is whole it is employed for rooking, for the river boats, as well as for making sindges, carts, boxes, etc. When it is re-moved in severain pieces it is used for marting and bags. The bark of the young linden trees is used for making-copies, assignis for the peasants, and for all sorts of hankers, etc. The trees must be at least three years old before they are large enough to be pealed for young linden trees are required.

The trees from which the bark is removed are felled

during the following summer or fall and the wood con verted into charconl, which is said to be of very good quality and is highly prized by the manufacturers of gunpowder. The young forests of this species are thus being rapidly destroyed in consequence of this enormous use of linden bark procured from the promising young trees. The bast of still larger trees is used for other purposes. For instance, trees from eight to six teen years old are cut for making mats. The bark is first cut or divided longitudinally into strips from 4 to et long and then raised with an instrument made of bone, after which it is easily torn off with the hand. When the bark is removed it is stretched on the ground to dry, two or three strips being laid one over another and kept straight by being tied down to long

The bast for foreign consumption is made into mats which are generally about six feet long and three feet six inches wide These are used especially for packing large objects as machinery and furniture Excelsion and other packing material lase during more recent years been substituted for bast—immense quantities of bast are consumed by gardeners in Europe About twenty-five years ago the annual production of bast in Russia amounted to about 14,000,000 mats, and about one fourth of these were for export.

When the bark is to be used for cordage or for cloth it is first steeped in water for several days until the tortical layers separate from each other. The best and strongest fibers are in the layers next to the wood, and the coarsest and weakest are nearest the outside. After the fiber has been macerated it is employed in England for making stout ropes, in France for well ropes and clothes lines, and in Sweden for fishing nets, for purpose its durability eminently fits it. Russia Russian bast is used also for making excellent paper of remarkable amosthness. Formerly gardeners used it very extensively all over Europe and in this country as a cover-ing or protection to glass frames. Its use for this purpose has fallen off considerably since the introducpurpose has haren on considerants since the introduc-tion of raffia, which has become so popular in nursery work and green houses for tying up young trees and garden vegetables. It is still used in Russia for making baskets, hampers, and prepared fiber for hats and cordage of the fluest quality. Like the closely related Japanese linden tree (Tilia cordata) it is sometimes used for making a coarse cloth and in the manufacture of moscuito nets

continual destruction of the young trees through this wasteful practice

of removing the bark naturally diminished the supply The The pensonts in a good many regions where the trees grow still utilize the bark for numerous purposes, but other material will gradually be substituted, and the bast only or smoothurch, and the bast only of merchantable trees utilized for making superior grades of paper. The wood liself is very white, light, close grained, and is used for interior finishing, carving work, barrel heads, and in manufacture of carriage boxes, cheap furniture, etc. Quite a demand has recently sprung up for linden wood, both this country and in Europe, by the manufacturers of cigar boxes. This at once rendered the wood too valuable for the trees to be cut before they have attained merchantable sizes.

There are many other uses for which it is especially adapted.

and the value of the wood has now surpassed that of

## Rolling Lead by Electricity

EAD is now worked in the Benthen plant in Germany EAD is now worked in the Denthera paneous by means of electric motor-driven rolls. these having been driven by steam up to a recent date. There are now two separate rolls used for producing sheet lead of various sizes. On the smaller of the two rolling mile is used an electric motor running at 345 revolutions per minute with a double gear reduction, the rolls being 10 feet in length hes diameter, and running at 5 revolutions per minute. The second set of rolls is 12 feet long and 21 inches in discount set of rolls is 12 red long and 21 inches in diameter and works at 7 revolutions per minute by means of a 60 horse-power electric motor. Wormsgear reduction is used in this case to reduce the motor. gest reduction is used in this case to reduce the motor speed from 345 revolutions per minute to the above. The electric motors are operated directly on a high-ten-sion circuit of 2,000 volts and are equipped with starters placed in an oil bath. On the tests of the present rolls it was shown that when starting with a 7-ton lead plate of 6 inoh thickness, working at a heat of 100 deg. Cent, the width of the plate being 6 feet, about 65 horse-power is required to roll this down to a 0 12-meh thickn the whole, the electric driving is considered as much the best method for this kind of plant.

automent of Air Velocity and Pressure, Physical Re-

<sup>\*</sup> For areas below a square yard the coefficient of resistance minishes slightly with the area.

impliables slightly with the area.

\*\*As an assegulate files downward more steeply and swiftly in angle of incidence dimbolahes more and more; and if the aritime to openevar the center of fill on the wing more medically the procedure of the control in downward sight.

\*\*Red to be a steep of the control in downward sight.

The Biggest Ship

The Biggest Ship

I'll is ensist to results the dimensions of big constructions on land than of those afoat on the sec. The
fill building, for instance, looks its size, for it stands
and other structures, with whose dimensions we are
familiar and by which we can gage the stupendous proportions of the sky-scraper. But when the giant steamship is affort man the high year it is seldom that there any object in her vicinity which serves to convey to the mind an adequate sense of her great proportions.
It is for the foregoing reason that the artist has

taken the liberty of upending the largest steamship in world, and standing her side by side with the world's tallest building. The result is certainly Brob-

dingnagian and well cal-culated to impress the man on the street with a sense of the huge dimensions of length, breadth and depth, which characterize modern steam-ships of the largest HIZE

The Woolworth Building, which for the time being holds the distinction of being the tallest office building in the world, is certainly a most imposing structure Architecturally, of course, it may be open to objections on grounds of res thetic taste, although, in justice to the architect, we must confess that in view of the severe condi-tions imposed upon him we consider that he has produced a very credit able result. The Woolworth Building stands on a plot about two hundred et square, and it tises to a sheer height of seven hundred and fifty feet above the sidewalk Had the tower stood in the center of the mass, in stead of rising from the center of the Broadway façade of the building. the total result would have been better; but it was not until after the building was started that additional land to the westward was secured— this at a time when it was too late to alter the original location of the

To anyone who is not familiar with the exact clinensions of the largest ocean liners, it would seem impossible, as he gazed skyward to the finial at the top of the Woolworth Building, that any ship, if stood on an end, would reach so far into the heavens -cer-tainly he would be sing gered to learn that the Hamburg American liner would out top the plie by no less than one hundred and fifty feet

## What is Miasma?

I N a remarkable lecture at the University of Geneva Dr A Tillat, of the Pasteur Institute in Paris, recently expressed the view that the old idea of "miasma" in relation of to disease is in a great measure reconcllable with our present theories as to the nature of infec-

From ancient times down to the middle of the nineteenth century infectious diseases were supposed to be due to a corruption of the air.

especially as resulting from putrefaction. Thus a certain epidemic at Venice was traced to an accumulation of decayed fish; one at Delft to spoiled cabbages, etc. The idea of a bad ofor was inseparably connected with the vitlated air, or missma, that spread infection; hence, the wide use of deodorants as a means of pro-

Doctors and priests, required by their profesions to minister to the plague-stricken, carried per-fumed torches, incense-burners, and the like; houses and towns were disinfected by burning various sui stances that were supposed to neutralize the poison in seral were supposed to fectant Hippogrates caused fires to be lighted in the

berries was a 2 resulting vapor being re-

With the advent of back as a cause of infectious disreputa. Since these di henceforth applied directly to the de ss. The point that ap of, according to Dr. Trillat, is s are no longer looked up infection, yet they may greatly pro

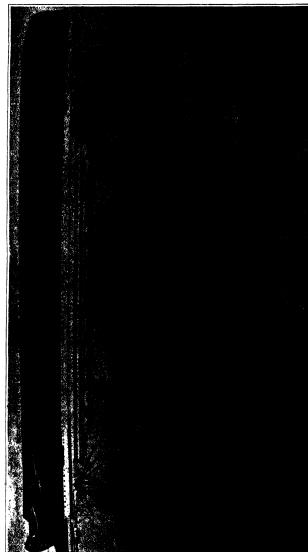
> of b periments that he products of putrefac on the vitality and fe dity of pathogenic teria. Without res ing the details. ives des Boiences phys iques et maturelles for June 15th, 1912, it man be stated that the d opment of the germs of diphtheria and plague was found to be remark ably stimulated by their exposure to air containing small traces of putrid The experiments were first tried upder lab oratory conditions; then confirmed by exposing similar bacteria to the products of natural putrefaction out of doors, as in the neighborhood of like.

The upshot of these periments appears to be that the development of pathogenic bacteria is greatly Miected by the composition of the at-mosphere. The subject is by no means simple; one species of bacterium may very differently affected from another by a given gas. Nevertheless, it seems likely that many now obsolete methods of disinfection may be rehabilitated as a result of further studies in this

M. Trillat is respo ble for the optnion that the rapid souring of milk and putrefaction of meat during thunderstor similarly due to a change in the composition of the atmosphere at such times, and not at all to elec trical discharges, as has often been held. According to his view, the diminution of barometric pressure accompanying storms promotes the release of putrid gases from the soil, and these gases stimulate the de velopment of the bacconcerned in two processes in ques-

THE British Consul at Calais reports that a French company is sariproject of a pass acropiane service be Calaia and Dover, has made propos the municipality of the town as to the

SERVICE SERVICE AND SERVICE SERVICES



The "Imperator" 900 feet, Weelworth Building 750 feet. THE LONGEST SHIP AND THE TALLEST BUILDING



# The Race for the Harmsworth Cup

The Technical Lessons of a Great Contest

By Thaddeus S. Dayton



The engines of "Maple Leaf IV."

The "Ankie-Desp" going 40.3 miles an hour.

As the English-built "Maple Lasf IV" holds across the finish line on Huntington Bay hast Wednesday, winning the instructional motor boat trophy offered by Lord Northellie, which has been held by this country since 1907, Commodors H. H. Sileville, chairman of the Board of Gormoors of the Motor Boat Club of America, challenged the Royal Motor Yacht Club for a return race in British waters next summer. The content that has just ended taught some very simple but highly important lessons to the American builders and owners of sex-speeders. These will be heeded carefully, and carefully and that it will be a long time before it crosses the Atlantic again.

To underected what these lessons were, a brief release of the three recess that resulted in a British victory is necessary. The first "leg" of the three contests was run on Saturday, August Sist, There were three American and two British cutries. The American boats were "Baby Bellance II," owned by J. S. Blackton; "Haby Re-Biance III," owned by Mrs. J. S. Blackton; and "Ankle Been," owned by Count C. S. Mankowsky. The British loats were the "Monn." Marquis of Anglesey owner, and "Makple Leaf IV," the property of E. M. Begar.

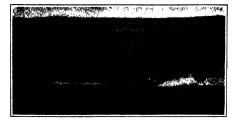
"Baty Reliance 11" is a black-hulled boat, twenty feet long, driven by one motor of eight cylinders and one hundred and fifty horse-power. Bernard Smith was the helmsans and W. Buch the mechanician. "Baty Reliance 11t" is twenty-six feet long, driven by a motor similar in size and make to that in "Baty Reliance 11t", Jay Smith was her helmsans and W. Blacke Van Noerfrand the mechanician. "Ankle beep", the travel of the properties of the pro

The British bosts are both built of mahogany and finished bright. The "Maple Lard IV." 39 feet 11 Inches long, is a Futher multiple-step hydropiane, driven by two sixteen-cylinder motors of three hundred and fifty horse-power each. Size has two propellers and two runders. Tom Sopwith, the aviator, was helmsmun and Arthur Allison mechanician. The "Mousi is twenty-six feet long. Thornycroft designed, driven by a gnotor of one hundred and fifty horse-power. Moutague Saiting, her designer, had the wheel, and Frank Murtagh, who was in the "Figueer" lest year, was mechanician.

leat year, was, mechanician. This course was thirty matteri miles, or four times around a triangle of seven and one hair nauteri miles, in the sheltered wajon; of the lay. The venture condition of this first day's nece were steal for the American loats. At no time was the pulsar, willed enough to make the go-interior.

This diest contact was won by "Baby Reliance II" in forty-eight minutes and thirty-sine seconds. Mer average speed was

Marketin and the news.



"Maple Leaf IV." Winner of the Harmsworth Cup.



"Maple Leaf IV" at full speed.

Note the height of the wave that she is dashing up



"Baby Reliance II." She is 20 feet long, and is driven by



"The Mona" making one of her remarkably short turns.

She is 20 feet long and is driven by a motor of 150 horse-power.



"Saby Reliance III" at full speed.

She is 36 feet long and driven by a motor similar in sice and make to that of
"Baby Reliance II."

37.11 mutted or 42.73 statute inlies per hour. She flished seven infinites thirty-inlies seconds ahead of the "Monia". The "Maple Leaf IV" had engine trouble and started more than twenty-one infinites late. All she tried to do was to qualify for the next race. "Bals Reliance III" and "Ankle Deep" also had engine trouble, and came in fourth and flish.

and came is fourth and fifth. The following Monday, when the next heat was scheduled, the weather was so rough that it was agreed to postque the context until next day. The victor was the "Maple Leaf IV." "Mona," second, with "Ankle Deep," "Baby Reliance II," and "Baby Reliance III," and "Baby Reliance III." finishing in the order named.

The wind and sen had been high the day before, but on the afternoon of the race the wind dropped to a gentle breeze Out on the Sound, however, along the edge of which the boats had to go, there was an ugb swell left over from the northeast gate. The "Ankle Deep" got away in the lead, with "Baby Reliance 11" a few seconds belind and the "Maple Last IV" three seconds late, her exhausts silent and only the "singing" of her powerful motors to be heard as she plowed a great wide furrow of foam and stray. "Bably Reliance II" was in trouble with her engines and crossed the starting line more than three minutes late The "Monn" was even woose off, for she was unable to reach the start for eight minutes and seven seconds.

When the boats struck rough water, running west on the base of the triangle, the three American boats soot in trouble again and had to stop. Then 'Maple Leaf IV,' going as stoady as a church, took the lead and never was headed after that. The 'Maple Leaf IV,' are leaf IV,' are leaf IV,' are leaf IV,' are leaf IV,' and the struck of the 'Monis', 20.13 knots (31.24 miles), the 'Monis', 20.13 knots (33.49 miles), 'Baby Reliance III,' 25.76 knots (28.49 miles), I's should be noted that 'Maple Leaf IV,' a swrape speed was more than elevan miles average speed was more than elevan miles less than that of 'Raby Reliance II' in the first heat when the water was smooth.

the minest source in water was smooth. On Wednesday, the day of the deciding heat of the race, the conditions again were ideal. The greater portion of the course was like a mill pand with just enough berease to hely ione down the heat count he was the mill was "Rellance" or the blazing sun. It was "Rellance" weather and water, and everyone was confident that the trophy would romain with us for another year at least. The "Monin" was the first to cross the starting line; a down seconds later "Ankle Deen" line; a down seconds later "Ankle Deen" the line; at least 10 mill miller late 11 was a least 10 miller later 11 m

and was the last to start beep" overhauled "Mona" and "Reliance III" also passed the British boat. "Reliance II" put her best foot foremost and began to gain on "Ankle Deep" Down the back stretch these two boats raced a length apart, plunging heavily in the water. "Maple Leef IV" kept up a uniform pace behind them "Reliance II" finished the

(Continued on page 222.)

## SCIENTIFIC AMERICAN

## New Metallizing Process By Dr. Alfred Gradenwitz

Dit SCHOOP, of Zurich, Switzerland, was watch-Ding his children at play with a Flobert riffe when he chanced to note that the bullets striking a wall were crushed thereon, producing a strongly adhering head conting. This led him to make some experiments with small shot, which brought out the fact that the

grains of lead on being crushed form a practically homogeneous layer, provided their surface is cleaused and freed of any trace of graphite.

Although this metallizing proce announced some time ago, the details of the process and the apparatus it require have only just been made public. the first metallizer constructed by Dr Schoop, molten metal was pulverized by a jet of high pressure steam, and projected in a stream of spray upon the obfect to be coated with metal. This, however, required a stationary apparatus. In the portable apparatus, the molten metal the portable apparatus, the molten metal is replaced by a metal powder, which is carried along by a Jet of steam or of compressed gas. The jet of gas is heated either by means of a finme or an electric resistance or are. The particles of metal powder are shot out of the apparatus by means of a jet. The object to be conted with the metal is thus bombarded with a hall of fine metallic particles. At the moment they strike the surface there oc-curs a transformation of five energy into eat, and this heat contributes to liquefy ing the particles so as to solder them to

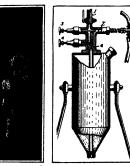
A very convenient form of portable ap paratus is represented in the diagram. The mot piece C, from which the jet heated by a gas flame The mouthblown forth, is fixed at the end of a flexible tube. The blown forth, is fixed at the end of a fixing time. The gas enters through the valve 2, into an inner tube fit-ting concentrically with the passage 7. The air, which is generally at a pressure of five atmospheres, passes through the tube (1) into a chamber fitted with two valves (8) and (4) By turning the valve (3) compressed air is admitted directly into the passage (7), and by operating the valve (4) it is led into the lower

half of the apparatus, where it produces a whiri of metal powder, carrying along some of the powder into the conduit (6), then into the conduit (7), and finally into the flexible tube connected with the mouthpiece. The apparatus is mounted to turn on a horizontal axis, so that the last traces of metal may be removed by the compressed air, by tipping the apparatus on its axis

The apparatus is started by opening the gas valve (2) and igniting the gas. The compressed air admission having been opened, the valve (3) is adjusted until a satisfactory flame is obtained. Then the valve (4) is opened so as to introduce the metal powder. In order to insure a really homogeneous layer, it is essential that no oxide film covers the particles. This is why an inert or even reductive gas and electric heating are used in connection with highly oxidable

used in connection with highly exidable metals. A stilking feature of the operation is that the expansion of the gas is attended by a strong cooling which solidifies the metal rapidly, while the surface temperature remains low, in fact, with such metals it is below 60 deg Cent (140 deg. Fahr.). This is why infimmable substances, such as celluloid, as well as flowers and fruits can be metallized. The thickness of the deposit may vary between a hundredth of a millimeter and several millimeters, depending upon the surface to be conted, and on the relative speed of the let. The latter also governs the hardness and density

of the metal coating. This system of metallizing has been used for forming accumulator plates; constructing resistances in the form of a metal thread of zigrag shape; obtaining electric contacts instead of solder-ing them; and metallizing the clothes of electricians. This last is a very interesting application. If the clothes of electricians are metallized they are protected against high tension current, as in the event of a contact the current would pass through the metal-



Apparatus adopted by several large French works for zinc, lead and copper plati

Details of the apparatus for ing pulverized metal. NEW METALLIZING PROCESS

lized surface and not through the body of the elec-

#### The Electric Tow-horse

The management of the port of Altona had for some time past to face a rather difficult problem that baffed many attempts to solve it. The question was how to transport the wares unloated at the harbor over two roads of a heavy gradient. As only



THE ELECTRIC TOW-HORSE HAULING A TRAIN- OF TRUCKS

horse vans had so far been used in this connection, it was considered impossible to replace them all by motor trucks. On the other hand, the horses drawing the heavy loads over mountainous roads proved more and Finally a commore insufficient to fulfill their task. between motor and horse traction was settled

In Europe trackless trolley lines are coming more and more to the fore as a welcome substitute for street tramways. Being independent of any strictly limited tramways. Being independent of any strictly limited course and much cheaper in installation, this means of transport doub transport doubtless possesses a number of adva-and is operated on a profitable basis where a ra would not pay.

The new hauling service of Altona harber based on this system. It is adapted to deal with average daily traffic of 200 vehicles, each carrying load of from 5 to 7 tons over two paved roads about 600 meters in length, which lead at a gra of 1.18 from the harbor over Kriktrasse and 2015 as far as the city hall. The pushing hauling tractors used in this connect

naumn tractors used in this connect are operated by electricity, being through a double pole overhead line v 550-volt direct current from the min pal central station. They travel with rails, being able by their trolley arra ment to deviate sufficiently to pass wehicles. On going downhill, these loos-motives travel with the trolley removed, A train of two or three teams can be

hauled by the electric tractor. The horses are not unhitched, but follow in the hauling train, being merely relieved by the hauling locomotives. The coupling devices are so arranged that the vehicles can be uncoupled without stopping.

Each journey of a hauling train, inclu-

sive of the coupling and uncoupling, takes S minutes, and as the downhill course takes 7 minutes, four trains can be dealt with each hour by a single tractor.

## Swedish Method of Artificial Restoration to Life

## By the Paris Correspondent of the Scientific American

A SIMPLE and convenient apparatus
for producing artificial respiration has
been invented by Dr. K. A. Fries of Stockholm. It is like-

oven invented by Dr. A. A. Fries of Nuccanoni. It is and by to be valuable in restoring animation after asphyxia. The apparatus is made up of a wooden base in the form of a shield with a part at one end for resting the head, and to this is fitted a light steel frame co head, and to this is fitted a light steel frame consists of a pair of uprights joined by a cross-bar. On the bar are automatic clamp straps for fastening the arm, on the cheat a canwas gride or band is placed so as to compresse this part of the body, adjusting property of right by means of eyelest. The device is first laid on the floor or table and the

metal frame folded out, laying the patient on the base, and the wood head-piece then adjusts the head and throat automatically in the right position. We then apply the girdle on the lower part of the chest and fit it snug by the hook and the cord. Adjusting the cross-bar to a good height, we strap the wrists loosely to it, as our engraving shows, then the frame is ready to be operated for producing respiration. The frame carries chains and cords which connect its movements by means of pulleys with the chest girdle, so that the st is compressed at the right time.

The work of respiration is begun by extending the levers horizontally backward so as to produce inspiration, and in this position the chest girdle lies loose. We then draw up the levers to the vertical and bring them down toward the lower part of the body so as to give the expira-

tion, and here the cords and pulleys act so as to com-press the chest band and aid in expelling the air from the lungs. At the same time the patient's tongue is drawn outward by the other hand by means of a hand-kerchief or ring forceps. The movements are kept up regularly back and forth, keeping time with one's own thing, or about 16 times a minute.

breating, or about to times a minute.

The device is very compact and can be folded up so as to occupy a space of three feet by two feet by four inches, and may be hung on the wall or stowed away

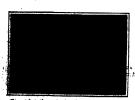


Working apparatus with one hand, and attending to the tongue with the other.



The device and patient ready for the operation. Method of fixing the arms.





The complete apparatus is: Strapping the wrist hands to the creposition for use on the table. The girdle shown tight across the

Carrier and Section 1988.

SWEDISH METHOD OF ARTIFICIAL RESTORATION TO LIFE

## miluminescence"—the Transformation of Chemical Energy Directly into Light J. Alex. McDermett, Research Fellow in Utilization of Fruit Waste, University of Pittsburgh

The second secon

of Frust wasts, Caramity in Transaction.

1 the production of light by chemical reactions in which the temperature is below that of incandescence. The most common illustration of this is the luminosity of phosphorus and its solutions in various liquids, which give light when exposed to the air. It is probwhich give ingu when exposed to the air. It is prob-able that the phenomenon of the firefly and similar forms belongs strictly in this class. A considerable number of reactions have been at various times de-scribed as giving light under conditions precluding the possibility of incandescence, and an exhaustive review of these has been given by Trautz in the Zeitschrift für physikalishe Chemic, Vol. 153, pages 1 to 111, 1906. For the most part, however, the lights emitted are rather faint, and often, unless the conditions of the experiment are just right, no light is produced. The three following experiments are rather easily carried out in any laboratory, and may prove of interest to

ne of the readers of this paper:
. The reaction of Trautz and Schorigin (see Trautz, supra, and Trautz and Schorigin, Zeitschrift fur wis-senschaftliche Photographie und Photochemie, 1905): This depends on the rapid oxidation of an alkaline solution of pyrogaliol containing formaldehyde. The apparatus which the writer has used to show this reaction consists of a reflux condenser D with a bulbed con-densing tube, set horizontally, and two or three separafunnels. (See figure.) In a funnel A is placed ion of 12.5 grammes of pyrogaliol in a mixture In a funnel A is placed a 25 cubic centimeters of commercial formaldehyde (37 per cent) solution with 50 cubic centimeters of water. funnel B contains a 40 per cent solution of sodium of numer is contains a way per cent contain or samular in potassium hydroxide; a third funnel  $\sigma$  (not shown in figure) contains "Perhydroi" (30 per cent hydroxen peroxide solution). In place of this latter, the usual pharmacopodal 3 per cent solution may be used, in which case this third funnel must be much larger than A and B, and the inlet for the peroxide solution into the condenser must be larger, to permit of more rapid flow. A solution of hyperol, the urea-hydrogen peroxide compound, made by Richter, Budapest, may be used with advantage in this reaction. A solution of ten or twenty grammes in about 50 cubic centimeters of distilled water will produce a good light. Still more simple, instead of funnels B and C, a single funnel may be used, as shown in figure, containing 150 cubic centimeters of distilled water in which about 40 grammes of sodium peroxide have just been rapidly stirred. In place of the condenser, a simple glass tube surred. It place of the concenser, a simple glass there has be used, one of 2 centimeters internal diameter being convenient; the advantage of the bulb tube is that it tends to delay the passage of the liquids to the exit, permitting the greater part of the light-emission to take place in the tube.

To operate, the stop-cock on A is opened so a allow a slow stream of the pyrogailol solution to flow into the mouth of the condenser; the stop-cock on B is then opened so that the alkali solution will flow about as rapidly as the pyrogaliol; (' is then opened so as to permit the peroxide solution to flow down and come in contact with the mixed liquids from 1 and B. olutions are right, a stream of

light will be seen to travel along the condensing tube of the condenser. The light is not by any means as bright as that of the firefly, and this experiment must be ormed in a dark room, as must also the following one. The reaction is actie heat, and formaldehyde is evolved. Owing to the formation of dark colored exidation products of the pyrogalloi, the light will appear reddish in color. little manipulation of the stop-cocks may be necessary to secure the proper

2. The reaction of Heckno (Chemiker Zeitung, Vol. 35, p. 190). This reaction depends on the oxidation of phenyl magnesium bromide or iodide by moist air. nestum bromide or todide by moist air. It is necessary first to prepare the re-spent, phenyl magnesium bromide (or todide) which may be done by the meti-od given in Heckno's space. The appa-ratus necessary is very simple; the com-pound, in solution in analytrons ethor, may be simply shaken with air in a test may be essepty shaken with air in a test tube, or it way be poured onto a piece of moistaned filter paper, or it may be slowed to from from a funnel onto a moistened filter super. The light is pale greenful, and of about the stone intensity maginat of the foregoing reaction.

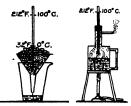
Wedskind has found that when this compound is a didded to an extremal object.

of chlorpicrin (nitro-chloroform), a

8314

an "flame" is produced, which does not ignite the

The reaction of Schwersenski and Caro (Chom-Zeitung, Vol. 22, p. 58). This reaction is quite brilliant, and depends on the oxidation of certain or ganic substances by the gases evolved from potassium permanganate by the action of sulphuric acid. ssible that it is not strictly a case of "chemilumin possible that it is not strictly a case of "chemiumin-secence," and that the phenomenou may be referable to actual incandescence. The original directions of the authors referred to were to place in a test-tube 3 cubic centimeters of concentrated sulphuric acid, and then to overlay this with three cubic centimeters of sicohol, running the latter in slowly from a pipette, so



Determining the boiling and freezing points of

as not to mix the liquids A crystal of pota manganate is then dropped in, producing an evolution of gas in the acid layer; when the ascending bubbles gas reach the alcohol layer, they "go off" with a little explosion and a bright flush. After a number of ex-periments by the writer, it has been found that in place of alcohol, a better reaction is usually obtained with ordinary formaldehyde solution, the perman being dropped into the acid before the formuldehyde is run in over it (Potassium permanganate reacts with formaldehyde, and hence it is impossible to drop it into the acid after the latter has been overlaid with the aidehyde). Using about 10 cubic centimeters in a test tube 25 millimeters in inside diameter is quite afe, larger amounts are objectionable, on account the fact that should the tube be accidentally upset, the formaldehyde or other vapor will usually be ignited, especially if larger quantities are used.

In place of ordinary sleohol or the formuldehyde solution, any of the following may be used, though usually with not quite so good results, on account of greater volatility, secondary reactions, or slow resultion; methyl and amyl alcohols, acetone, acrolein an acetaldehyde solutions, lactic sold, amyl acetate, uttrobenzene. Orange oil, aniline, terpineol, and solutions of vanillin, citric acid, cane sugar, and of dextrose also give the reaction slightly on shaking, but these are unsatisfactory for demonstration. Benzene, urea, ac-tamid, acetic acid, and probably also, pure ether, do not show this reaction. While a discussion of the intimate chemistry of these reactions would be out of place here, it might be added that in all three it seems not unlikely that it is connected with the presence or formation of aldehyde groupings

#### How to Correct a Thermometer By Norman Barden

THERE are times when the home thermometer varies from that of the Weather Bureau. variably it is asserted that the weather man's ther-mometer is wrong; but let us see whether this be true or not. It is intended here to explain clearly how any body can correct his thermometer by finding the fixed points. The fixed points are the freezing and boiling points. The freezing point is the true fixed point, because the bolling point varies with barometric pres-sure. The variation of the bolling point must be allowed for, as we shall see later.

To determine the boiling point, place the thermometer in position in a boiler as shown in the drawing Have the boiler about one half full of water, and be sure that the bulb of the thermometer does not touch the water when boiling. Now the water is boiled, and the temperature is taken to tenths of degrees if possible A magnifier aids greatly in taking temperature readings. Next take the barometer reading, and calculate the true boiling point by means of the formula:

 $T = 100 - 0.0375 \ (760 - b)$ 

in which b is the barometer reading in millimeters, and is the temperature of the observed boiling point in Centigrade degrees Example Supposing b to be 732.4 millimeters, then solving for T, we get 98.065 deg. Cent.; which is the true boiling point for 732.4 milliters pressure The difference between the true and erved boiling points is the boiling point correction.

The freezing point is found by packing the thermometer in finely crushed ice. Leave the thermometer in this position until the mercury ceases to fall. Take an exact reading as before, using the magnifier, and this is the true freezing point or zero. Now, divide the number of degrees between the observed zero and the true boiling point by the number of degrees between the observed zero and the observed boiling point. This Example: gives the thermometer correction per degree the observed boiling point was 988 deg. Cent, and the true bolling point was 98.0 deg Cent., also that the observed zero was exactly at zero degree on the thermometer. Then,

98.9 -- 98.8 -- 1 001.

or the correction of one degree. That is, if the temperature on the thermometer rend 1, the real temperature would be 1.001 degree, or if the temperature re 20 degrees, the real temperature would be  $20 \times 1001$ , 20 02 deg Cent

Most thermometers will have a correction of a degree or more. In this article Centigrade readings have been used, but the method for Fahrenheit thermometers is used, but the method for randometer thermometers in just the same. If it be desired to convert Fabrenheit into Centigrade or  $tree\ rersa$ , this may be done by substituting in the following formulas  $9\ (C=32)$ 

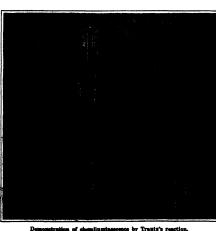
It will be found quite interesting for those who have never tried to find the true freezing and boiling points, to correct one's thermometers in the manner de-

scribed, and then have the satisfaction of being able to find the correct temperature at any time

## An Inexpensive Oxygen Retort

By John Phin

OXYGEN is sometimes prepared by heating chlorate of potash and some inert substance in a glass flask or even in inert substance in a gines hask of even in a large test tube, but gines vessels are so easily broken that metal retorts are usually preferred. The retorts offered by the makers of chemical apparatus are onite expensive, but one equally as good may be had for a tritling sum from any plumber or gas fifter. The one fuse is simply a piece of gas pipe 15 inches long and 1½ inches in diameter. One end is closed by screwing on a common cap such as is used by gas fitters, and the other end is squared up and the inside reamed out smooth and slightly content, so that a good sound cork may be used to close it Through this cork is passed a glass or from tube on which is slipped the rubber tubing used for delivery. With a good cork and reasonably tight-fitting joints both for the 114-inch tube and the smaller tube, this retort will sustain considerable pressure without loss. It may be heated in a common stove by holding the corked in a common stove by nothing the consequent in the hand. Two ounces of chlorate of potash with an equal bulk of black oxide of manganese or even clean, fine sand will produce four gallons of oxygen.



## Extracting a Lion's Tooth

TOOTHACHE seems to be a concomitant of civilization. Civilized people with perfect teeth are comparatively senter Uncivilized and even semi-civilized people give their teeth no care, and vet they remain white and sound; but let such people move to a civilized land, and dental (toubles will be sure to develop. The Bulgarian peasant knows neither toothbrush nor toothache, while his felow townsmen suffer greatly from caries. The same seems to be true even of wild animals. When, as captives, they are brought into touch with civilization their teeth not infrequently yield to our highly recti not infrequently yield to our many civilized disease, and the surgeon of the zon is obliged to operate upon them. As may well be imagined, his task is no simple one in the case of large ferocious animals. The accompanying photograph illustrates such an operation recently per-formed at the White City Jungle, London, to Dr Watt, a West London veterinary surgeon. The patient was a lion cub, fourteen months old, which had been suffering with toothache for some time He was drawn up against the bars of his cage and held firmly with ropes; then his mouth was kept open with chunks of wood while the surgeon drew the decayed molar. The tooth may be seen in the surgeon's pliers at the right of the picture.

## Moving a House by Boat

A CHICARO real estate dester recently house on East End Avenue, Chleugo. In that location the investment did not appear to be gillediged, but the dealer knew that the same house, located in another section of the city, would find a ready sale at a greatly appreciated price.

To move it in the ordinary way on land to that other district would have entailed expense so great as to whe out the profit he hoped to make. No he develded to move the house by water. Set upon the ordinary skids, the house was hauled to the shore of Lake Melkham. In order to get the house upon the barges and secows on which it was to be towed along the lake shore, it was necessary to build a pontou, and this operation had to be repeated when the house how-to-off the site of its new location.

Two large scows were bashed together and norred close bashere. Anchored fore and aft and snubbed up on the shore, the scows were held firmly in place, and then guyed by heavy hawsers, the house was skidded upon the scows.

guyed by heavy hawsers, the house was skidded upon the scows. A dozen "husky" stevedores warped the combination offshore, a tug hitched a hawser to the scows, and one hour later the house was sumbled up against the shore twenty-four blocks south of the starting point

In less than forty-eight hours time all did the house was reposing on new foundations at Lake Avenue. The entire distance, by land, was more than three miles. Fortunately there were no signalls or other weather disturbances to interfere with the work.

## Phonographs for Aviation Scouts

A CORDING to experiments made at the But accepting mounds, near barts, it is no found necessary when seconing to carry a second man acting as observer. The pilot can make all the records of the flight by speaking into a specially arranged phonograph. This was tried with good siscers on a Pagnan necessition with the wind of the secondaried by Capl But's, who was accompanied by M. Julies thichard, the inventor of the new "Romeophone," as it is contained in ordinary cases the pilot, when alone, is not able to mote down all that he sees, for even should be a table to write, he must then cease to observe. With the new phonograph this drawbark, is overcome, and without consider the size of the connects with the phonograph so as to make the record. The record is made on a disk, which when filled may be put into a boy and dropped from the serve.

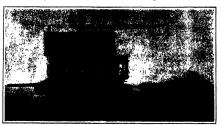
Readers are invited to contribute photographs of novel and curious objects, unique occurrences and ingenious contributes. Such as are found wealtable will be paid for promptly.





ly coursey of the sphere. Extracting a lion's tooth.

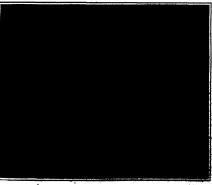
Putting the helmet to test.



Moving a house by boat,



Scout aviator making phonograph records and dropping them to the ground for reproduction.



A pair of pigmy hippopotami from Liberia.

plane at any point, while a family distinguished for another event. It seems to the more done for another making a fine short done for more making a speed, perced of the taken signs he date. Thereig size flags, in the confidence of the family should be suppossible to the confidence of the first suppossible to the confidence of the suppossible and afterward when adjusting the research could be very well beard. All the assimplane officers of the Sac granted free improvement with the results.

## Safety Helmet for Aviat

O'NE of the pupils of an aviation school in England has recently devised a hendgear which has recently devised a hendgear which has recently devised a hendgear which has above to protect the wester from shocks or blows. A writer in Fight, our English contemporary, from which the accompanying illustration has been culled, states that he had the playare of belaboring the inventor over the head with a piece of scentling while he stood passively emitting, without fooling the blow in the least. Then, in order to test the device, it was suggested that the inventor take a running leap full tilt at one of the hangars. This he did, as the photograph shows, and without injury to himself. The headquar is of leather well padded with horsehair and contains a system of fast steel springs, which have the effect of distributing the shock sustained by them over a large area.

## First Pigmy Hippopotami in Captivity

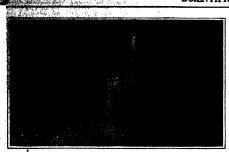
The New York Zoological Society has just secured some of the rarest aumais of the African fauna, a unique pair of pigmy hippopotami from the interior of Liberia.

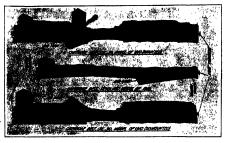
Though first discovered sixty-sight years ago by Jrs. S. J. Morton, of the Philadelphia Academy of Sciences, they have remained practically unknown, as no hunter or explorer has hitherto succeeded in capturing one alive. The two shown in the accommanging illustration are the first living specimens to be exhibited in civilization.

The animals were obtained from Mr. Carl Hagenbeck of Hamburg, and cost \$12,000. A special expedition was equipped for their capture in charge of Mej. Hans Schomburgk, an intrepid hunter and explorer. With a caravan of 100 men he penetrated the dense and road-less Liberian forests 200 miles or more from the coast. After many months of dangers, hardships and continual handing the pigmy hippopotami were locate the upper Lofa River. Here in their re-mote haunts about 100 pits were dug in various places to trap the animals. The pits were seven feet deep, and were care fully covered so that the sharpest eye could not detect any signs of danger. In could not detect any signs of danger. In these the pair of dwarf hippopotami, male and female, were caught. Maj. Schom-burgk states that unlike their big cousins, the pigmy hippopotami do not frequent the rivers. They make their home deep in the inhospitable forest, in the dense vegetation, on the banks of the small forest streams; but, not satisfied with the projection the forest affords them, they enlarge the hollows which the water has washed out under the banks, and in these tunnels, where they are invisible from the bank, they sleep during the heat of the day. It is very hard to even find a place re there is the slightest chan catching one, because this animal roams through the forest like an elephant or a pig, usually going singly, though sometimes in pairs, and rarely using the same track twice. The legs of the pigmy hippopotamus are longer and more stander in proportion than those of the larger species, and its eyes do not "pop" out of its head. Another striking character is the long tail, twelve inches in the adult ile, which is proportion is about twice as long as that of its glant living re as iong as that of its glant living relative. The face of the pigmy is relatively smaller, which brings the eyes measure to the median line of the shull. The two hippopotansi pictured are shout 3½ years old, stand less than two fact high and making meaning the popular of the shull be shull

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'The Buszicott cook stove

Variations of the Mills army belt.

## Inventors and the Army and Navy

The Government's Attitude Toward Inventions on Paper

By William Atherton Du Puy

A MONG investors there has grown up a pretty general conviction that in the military branches of the Government, the Army and the Navy, there is much discrimination in favor of the mee who are in those services as against the independent worker. They hold that the man on the outside who invents anything new in the way of ordnance, projectiles, armor or what not, has a much less chance of selling his patients to the Government than does the inventor of the same things who is in the service.

There is some basis for these charges. It is true, in the first place, that the Arny and Navy departments shabitually relues even to consider inventions that are offered by outsiders and that there may be such ideas as would be of much value to those services. These departments do, as a matter of feat, refue to examine practically all patented articles that are merely on paper. Any important article to be purchased by the War Department or the Navy Department must first have its utility very thoroughly demonstrated. It must be trief in actual operation. If it is a gund that is supposed to shoot five miles, the gun must be actually made and its ability to carry the given distance must be demonstrated in the field. If it is a powder that is intended to drive a given propostile through a given thickness of armor, the powder must be claimed for it. If it is a tent that is intended to resist claimed for it. If it is a tent that is intended to create contain weather conditions awar for a certain number of years, the time necessary to demonstrate those points will be taken by the Government.

The man in the service knows these things. When he makes an invention that he wishes to sell to the Government he never goes before the proper authority with mere sketches of his article. He has it in the completed form and has made overy arrangement to demonstrate it in actual operation. On the other hand, the cavillan inventor goes to the department with the mere plans for an invention. He is not in a position to make a proposition to the department upon the base on which it does business. He is not given any consideration. He feels he has been discriminated against. As a matter of fact, the has failed of an ample heaving because he is not prepared effectually to demonstrate his article.

Adds from this, the department is constantly working from the inside to improve its ordnance. The Government does not, however, patent its inventions in advance of their demonstration. At the time the cutted is inventor lays his patent before the department it may be that the same problegue are being worked out. If an inventor offered an acceptance gut to the Government to-day its would be more than likely that some of his ideas work to make the signal of the constant to-day its would be more than likely that some of his ideas work out in the Government is very busy along these lines. Unless this inventor had his gue completed and was ready to demonstrate it can improbable condition) he would be given little consideration. Later the same ideas might appear and he would be given while, as a matter of fact, they had been merely called out by the needs of the time.

needs of the time.

The man who is the Army or Navy quite naturally knows a great deal more of the needs of those services than does she man on the outside. This makes it more probable that he will make inventions for which there is questive demand. When this advantage is added to his inventions of the particular anamer in which such inventions in the particular anamer in the particular anamer in which are in the particular anamer in the particular in the

Again, it may happen that an outside inventor may demonstrate an article which is greatly needed by the Government. He may present his case to the general satisfaction of the given department. That department may want to huy his invention. There is, however, no money available for the purpose. There may be years of delay in getting from Congress the needed money. The man in the Government service is acoustomed to deal with governmental delay and red tape. The man on the outside is prone to think that he is being trified with, to become diagnated with the delay, and to ease-diplomatic relations. Here again the fault is not in a discrimination against him but in his lack of an understanding of the origencies of dealing with so cumbersome a outstome as the Government.

If the outside inventor finds that the Government is intrunging his patents, here again are conditions when convince him that the Government is attempting to do him an injustice. The Government long had the right to exice, under the law, whatever it chose in the way of an invention and make use of it. The Government might not be used and there was no chance of getting results through the Court of Claims. The Government maintained that it was favoring the inventor in protecting him from his rivals and that there was little reason why it should grant this protection to its own loss. Until quite recently it has therefore not been unusual for the Government to freely help itself to whatever it chose in the way

Many inventors have succeeded in getting pay for their patents by means of special bills through Congress. The Government moves slowly in the payment of any claims. Its officials are very conservative in the expenditure of mousy. They do not pay claims as long as there is any other setton they may take. These officials thus sesure themselves against any possibility of being held responsible for expending money when such setton was not justified. Many an inventor has gone hungry while waiting for the money on a perfectly good claim that rested in some Treasury Department pigeonhole.

that rested in some Treasury Department pigeonhole.

The Government three years ago came to the conclusion that it was making a mistake in not allowing
whoever made an invention which it used to profit
thereby. It got the idea that if patents for appliances
were paid for, the development of patents belowful to the
Government would be encouraged. A law was consequently framed by the Commissioner two years ago and
it finally passed. To-day there is a chance of sale of a
patent to the Government that is comparable with the
chance of sale to any other large business concern, and
the Government now protects the recipient of a patent
from Federal infringement as well as infringement by
private infividuals.

private indivisions. The private priva

assisty immest with the delicease makiner in which the Government estilise perfectly good claims.
When the civilian fails to sell a patent to the Army or the Newy and he feels that he has been done an injustice, he freely voices his dissontent. The public hears more or less of this dissolateacion. Just the opposite is true of the mass in the service. When he fails to get his invention accepted he may protest in his inner circle but there is little heard on the outside. This is because of a very peculiar and interesting condition with reference to inventions that exist in the Army and Navy and because of which the service inventor is at heart more bitter, in many cases, than is the man on the outside in the many cases, then is the man on the outside in the process of the service of th

Almost from the beginning of the Government it has been a matter of sentiment and of more or less general practice that the man in the service making an invention should not consider it as his own but as sometime accruing to the service with which he is associated. There is a departmental order to this effect in the Department of Agriculture in the War Department and in the Navy Department this rule has been enforced. There is no departmental regulation which places any stress upon the inventor or in any way makes it necessary that he should donate his invention to the Government.

The legal aspect of the matter has been definitely settled. The decision of the Supreme Court of the United States in the case of the United States v. Burns defines the rights of any officer or employee of the Government in his patented invention. That decision is, in part, as follows:

"If an officer in the military service, not specually employed to make experiments with a view to suggest improvements, devise a new and valuable improvement in arms, tents, or any other kind of war material, he is entitled to the henefit of it and to letters patent for the improvement, from the United States, equally with any other citizen not engaged in such service; and the Government cannot after the patent is assisted make use of the improvement any more than a private individual without license of the inventor or making compensation

But despite all this there is a general prejudice against the man of the Army or Navy making any money out of inventions. It is held that these men have been given their technical education by the Government and that they have drawn salarise from the Government during the time they have heen evolving these inventions. Therefore the inventions should be the property of the Government. The public is mediated to this belief. The majority of the men in the service either favor this construction of their duty or yield to public opinion. It is true that great numbers of very valuable inventions are thus given these services every year. On the other hand, the Government has repeatedly

On the other hand, the Government has repeatedly paid for the inventions of its efficers. The occasions are too numerous to mention, but reference may be made to a few. There is, for example, the Mills Woven Cartradge Belt, the Dashiell Brocch Mechanism, the Fiske Telescopic Sight, the Lewis Range Finder, the Driggs-Schroeder Gun, the Fletcher Brocch Mechanism, the Sibley Tent, and a great many others. The list of Army and Navy officers that have been pecuniarily benefited by their extended unventions would be almost suited by

their patents disconsist would be almost endiess. Their patents disconsist would be almost endiess. Probably the greatest success among the Army inventors has been Brigadier-Clemral Anson Mills who has made a large fortune through the eartridge belt that be called into being. When Gen. Mills was doing soout work in the West many years ago how segreatly annoyed by the fact that the army hells were constantly coming unsewed and failing to serve the purpose for which they were intended. He devised the one-piece woven belt that is now in use. When he had completed his belt he offered it to the Army through the proper channels but it met with no favor. He wanted to sell it abroad and sought a manufacturer for it. There was no machinery

that would weave it. He then invented a weaving machine to make this particular product. He took the machine and the belt abroad and sold them to different Furopean governments. Thus encouraged he returned to America and finally suc-ceeded in selling to the War Department and, having been at first turned down, forced the Government to pay him a handsome price. It is not known just what his revulties have been, but the figures of business in this belt done in a single decade show that more than a million and a half dollars' worth of them were tien Mills is now retired, and out of the proceeds of his belt has built a large and handsome office building just across the street from the War Depart-ment, and this he rents to the Government, and it accommodates overflow bu reans from that department.

The Sibley tent is an invention that has drawn a lot of money from the War Department II H Sibley patented it in ment, receiving \$10 each on the first fifty as an indication of a different treatment and \$5 each on 3,000 that immediately fol-accorded him. With all the facts in mind When the Civil War broke out Sibley identified himself with the Confederacy, and thereafter he received no reacracy, and therefore he received no and as a numer ness cannot or prounting or man continued to receive his proportion of the sented with no better understanding of royalties which naggregated something like

Mai. O M Lissak, U. S. Army, is the inventor of a machine for the manufac-ture of cartridge clips. This machine has on in use in the Government arsenals for many years, and it is claimed that it year The Government entered into no contract with Lissak for its use, and he had derived no benefit from his invention until, in 1905, a bill was introduced into Congress awarding him a lump sum of

Francis II. Buzzicott was a private in the army and assigned to the mess squad. In connection with his work in the field devised a range for baking bread. hese ranges were remarkable for the amount of bread they would produce in a given space and for their lightness of weight. They immediately found favor in the Army. Altogether nearly \$200,000 worth of them has been bought by the Army. They are manufactured by a company to whom Buzzicott assigned his pat-ents, and the amount of his royalties is

Capt. Thomas Franklin, U. S. Army, has made a more typical invention. He worked out a potato-peeling machine, the man-ager of the laundry at West Point collaborating with him. They assigned their patents to a manufacturing company in New York, and to date there have been some hundreds of these machines sold to the Government at \$250 each, out of which it is reasonable to suppose the inventors have received a fair royalty, and the end is not yet
Lieut H C Mustin, U. S. Navy, is the

inventor of a telescopic orduance sight which is used in the Navy. The owners receive, through an agreement authorized by the Secretary, \$50 each on these sights purchased by the Navy—The first pur-chase was sixty-six sights, which netted the inventor the neat sum of \$3,300

Philip Hichborn, Chief Constructor of the Navy, retired is the inventor of the Franklin life buot, a circular float with a patent torch that flares up when the ap-paratus hits the water. The inventor reecived \$50 for each buoy during the life of the patent, and since the seventeen years allowed him because of his protection expired, he has been receiving \$25 each royalty, as a result of which he has become a very wealthy man

J. A Mudd, Pay Inspector of the Navy, invented a carrier for pneumatic tubes, which he sold for \$1,200; Commander William Little of the Navy, a boller tube William Little of the Navy, a noner true stopper, which is now in use in very ship of the Navy. He has never received any money for it, but maintains that the Government should pay him one dollar for through the bester.

every stopper it is using. George Schild, a naval architect, invented George F Mare Island a caisson gate, which the Government built into a drydock at an expense of \$60,000, thereby saving itself \$40,000. Schild sued the Government, but there was no way in law that he could collect, as this was previous to the pas sage of the legislation that enables the Court of Claims to award inventors. L G. Hillings, a Pay Director in the Navy, patented an emergency food, selling his patents for \$500 in cash and two cents a can on all that was sold. The Govern-ment has been using adaptations of this food ever since. So tinued indefinitely. So might the list be con-

The man in the service is, therefore, em-barrassed by a semi-established custom of dedicating his patents. If he is not treated as he feels he should be when he offer his patents for sale he rarely makes much public clamor in the matter. It is, there-fore, taken that he is well satisfied with the latte fifties and entered late partner-ship with Maj William W. Buras, and those gentlemen sold tents to the Govern-with the clamor of the civilian, is taken it would seem probable that the inside man in the War or Navy Departments has a much less chance of profiting by his civilian. the

It is unquestionably true that both the War Department and the Navy Depart-ment are vigilantly on the lookout for any invention that will improve any one of the thousands of things that go to mak mayes the Government some \$40,000 a up the equipment of either of those services. Particularly since the passage of the law of two years ago is there an excellent opportunity to sell to these depart-ments patents that may be demonstrated in such a way as to show the advisability of their purchase. A survey of the whole situation would lead to the conclusion that either civilian or service man has an excellent chance of getting some of this Federal money if he but knows the adstable method of placing his invention before the department, and if he but accepts philosophically delays that are sure to come and bides the time of ultimate settlement.

## Notes for Inventors

A Non-renewable Incandescent Lamp.

—In patent No. 1,034,722, to General Electric Company, sasignee of M. M. Merritt of Middleton, Mass., is shown a non-renewable incandescent lamp in which a flament is arranged in a bulls and means are provided for defacing the walls of the lamp space when the lamp is violently heated.

Combines Coffee Pot and Tea Pot. a body of conical form a partition is arranged to provide two compartments, one for tea and the other for coffee. The compartments have individual spouts, each with a valve, and they also have separate lids or covers, and either or both of the compartments may be used as desired. The patent, No. 1,035,407, was issued to James R. Beaseley of Lynchburg, Va.

Novel Disposition of Aeroplane Plan Dickran G. Terzian of Washington. D. C. has received patent No. 1,035,660 which shows an aeroplane with a frame and front shows an aeroplane with a frame and front and rear pairs of upper and lower sustaining planes, with the planes of each pair extending in opposite directions and lapping at their inner ends. The upper plane of each pair is at the same side of the frame as the lower plane of the other pair.

A Baltimore Heater.-In a patent, No. 1,034,465, to James M. Kennedy and James O'Hara of Baltimore, Md., there is salms of riars of naturnors, side, there is shown on the sloping roof of a house a solar water heater, in which a glass covered box contains a number of thin flat hollow metal sections connected to form practically a coil and exposing their flat sects to

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the Sciences.

AMERICAN.

#### Of General In

HORSESHOR.—B. E. Cook, Union Co., N. J. Mr. Cook pro-and improved horseshoe arranged inproved horseshoe arranged for conveal-and quick attachment to the aminal's host tout the use of horseshoe nails, and to wo freadily replacing worn out calks with ones and insuring long life of the horse-

shoe.

MEDICATED AIR COMPOUND.—J. Connex, 4832 Bell Ave., St. Louis, Mo. The object of this inventor is to provide an atmosphere in a suitable incleauru or room impregnated with suitable chemical particles of dust which co-act one with the other, purifying which co-act one with the other, put and impregnating the air, and which are ed to be breathed, with the air, into the of autmais.

of animals.

DIRINFECTING AND SPONGING APPABATUR.—8. BABUCH, 788 Beck Rt., Broax,
N. Y., N. Y. This apparatus is especially designed for use by tailors in small tellor shops,
and is so constructed that the disinfecting assater performing its work on clothing or other
articles is driven through a suitable conduct
leading to the outside of the building, so that
it will not make its presence known in the

#### Household Utilities.

Household Utilities.
ATTACHMENT FUR MATTERS FRAMES,
O GAAN, New York, N. Y. care of Gasus
Spring Red via, 28-32 Cumberland St., Brookfor use in connection with and as constituting
an essential part of the frames on which
woren wire mattresses are supported in
stretched form. It supplies supporting means
for the mattress frame capable of adjustment
to adapt the mattress to beds of different
matters. widths

widths UNIER—P D. RIORDAN, 104 CLOTTIERS DRIER—P D. RIORDAN, 104 CLOTTIERS DRIER—P D. RIORDAN, 104 CLOTTIERS DRIER 1047

ling strate of air at such heights
COOKEM ATTACHMENT POR FURNACE
BOORS—C, F. Horrwan, care of Tuttle, McArthur & Dunricheck, 501 Hollster Bidg,
Lansing, Mich This dovice is readily attachable to and destability from a fernace door,
at the inside thereof, so that when the door
at the inside thereof, so that when the door
at lossed as basket or equivalent receptacle
forming a part of the device will be supported
over the bed of live ceahs in the furnace for
the bading of potatoes and the cooking of
other food

Designs. DESIGN FOR A CARIPET OR RUG.—W E. SAYER, Thompsoutlie, Conn. Mr. Skyere has lovented four new original and organization for the control of the cont

field, but of crisp outlines.

DERIGN NOR A CARPET OR RUG—J G
PROFIL. Thompsonville, Conn In this designs
main border is edged by acroll work inclosing flower patterns. The center piece and a
garland, or circle, in the body of the vig have
the same attractive features as the border.

Nors.—Copies of any of these patents will be furnished by the BCIENTIFIC AMBRICAN for ton cents each. Please state the name of the patentse, title of the invention, and date of this paper.

this paper.

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## Grenadiers of the Air

(Concluded from sage \$15.)

believe the statement published in Germany on August 15th, as coming from a "really reliable source," an engineer there has succeeded in constructing an there has succeeded in community as aeroplane, which by an ingenious mechan-iam can remain suspended for a con-siderable time in midair. Before accepting the announcement we must wait. Still, sights to meet such a case as this have been thought out, one such being an arrangement of mirrors for use at night when attacking warships at sea. The serial destroyer is supposed to be maneuvered above a vessel until the glare from her funnels is seen reflected in the mirrors, when the pres-sure of a button causes a dynamite

bomb to drop vertically onto the target.

These plans are excellent no doubt as far as they go, but they leave out of consideration the fact that the noise of the engine on a calm, still night would very engine on a caim, still night would very probably betray the approach of the air-craft, if an aeroplane—the insistent rattling hum of M. Salmet's machine along the coast line of the Isle of Thanet is in my ears as I write; and to silence the engine may involve loss of power at a critical time.

Again, although we have no actual ex-perience on the effect of the bomb-dropper's flying machine of the explosion of a heavy charge of, say, dynamite on the groundsurface vertically beneath, it may be as-sumed that he would be safer at some distance in a diagonal direction from the point of impact, so as to be clear of the upward effect of the explosion which must cause a considerable disturbance of the air in its neighborhood by concussion. It would be tter therefore on this supposition that the bomb should be delivered while the flying machine is on the move, and to meet this condition the best apparatus which has yet been tried on occasions open to the public and of which records are public and of which records are available for publication, is the one which scored a victory for the United States in the person of Lieut. Scott this year in the Michelin Target Competitions, for bomb-Michelin Target Competitions, for bomb-throwing from aeroplanes, in France. These, after being open for a considerable time, finished in the middle of August and the American officer, in a monoplane piloted by the French aviator, M. Gaubert, suc-ceeded in winning the \$1,000 Michelin prize for dropping fifteen bombs into a cur-ole 66 feet in diameter from a height of 656 feet by placing twelve out of the required fifteen provections within the area, of the fifteen projectiles within the area of the target. He had previously made an almost ceaget. The man previously made an almost equally good record by dropping eleven out of fifteen into the circle. Also in the previous week he had won the prize of \$5,000 for dropping the largest number of the control bombs into a rectangular space of 170 by 40 feet from a height of 2,400 feet.

These results are quoted from the Paris correspondent of an English daily paper Without having been actually present at the competitions it is impossible to judge how far the conditions approached those of war, except as regards the height of drop, but Lieut. Scott's apparatus has been described in the Scientific American of October 28th, 1911 and the British Acro for March, 1912. Although, like any other mechanism of a similar kind, it must require perfect co-operation, as the result of practice, between pilot and bomb-thrower, it is far and away the best and most prac-tical which has yet been heard of. The German authorities have carried out careful experiments from time to time and are understood to have satisfied themselves that the dirigible forms a better carries and platform for the bomb-dropper than the and platform for the comb-dropper than the aeroplane. The firm of Zeiss, have brought out a sighting instrument, but the particulars of this, like those of the German experi-ments, are kept seeing at present.

mants, are kept seeight as present.
It is significant, that he various large
dirighbes which are thing built as contract
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fuel and oil, the presumption being that a
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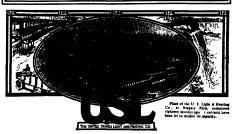
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apparatus is to be carried for dealing with explosive projectiles. We may therefore, sesume that bomb-dropping is considered, as a certous proposition by those makines who are most likely to have consider to practice it.

A single aeroplane may be a neg A mgre seropane may be a negacine quantity as an engine of destruction, but a feet of a hundred or so machines, working in sections, well organized, with carefully trained pilots and bomb-droppers and sys-tematic methods of ammunition-supply. nay be a very formidable instrument in the hands of a capable commander.

It must be remembered that a regular ombardment is a singularly inefficien commardment is a singularly inscined in method of getting results; sa a man-killing projectile the dropped bomb will probably be of inferior value, and the expenditure of time and energy required to fly to the seene of action, with the amail number of seems of action, with the small number of projectiles which can be carried at present, and return at intervals for fresh supplies will be very exhausting to the airmen, and cause considerable wear and tear of the machines. The trained pilot and his aeroplane form between them a unit which for some time to come will be too valuable for purposes of reconnaissance to be employed for bomb-dropping, unless under very exceptional circumstances.

Such circumstances might well be con-sidered to exist where the destruction of a specific nerve-center in an enemy's country could be accomplished by no other means and might cripple his organization and have far-reaching consequences, or in naval warfare when the location of a mine or of a submarine from overhead and its destruc-tion could only be accomplished by air-oraft. In the latter case the clever naval airman will probably be able to bring his marine, drop a charge of explosive, ar-ranged to act under water, and be well out of reach of the concustion before plosion takes place.

To the impartial observer with an open To the impartual observer with an open mind and some military experience the question of dropping projectiles from air-craft is a difficult one at the best, and by the light of such information as is available at present it would be extremely un-safe to dogmatize—the data are insufficient. All we can be sure of is, that there are great latent possibilities of aggressiv

## The Gnome Rotary Engine (Concluded from page 419.)

valves in the Gnome engine are removed with the greatest case, special socker wrenches being supplied for the purpose One is prepared for the construction wherein the cylinder is cut from a solid bar of steel, but one is genuinely sur prised to learn that the crank case is also cut from a solid drop forging. In the rough, this forging weighs no less than one hundred and six pounds, which weight is reduced in the finished crank case thirteen and one half pounds. Starting with one hundred and six pounds, no less than ninety-two and one half pounds of steel shavings are produced in the manu facture of a thirteen and one half poun crank case. Now, perhaps one appreciates why I said that the Guome factory was literally turning out steel shavings

Fig. 8 pictures the finishing of the hollow crank shaft. Upon this crank shaft there is one master connecting rod to which are attached six auxiliary connecting rods for the rest of the seven cylin ders. Annular ball bearings are used on both the main bearings, for the thrust bearing to take the thrust of the propelconnecting rod. The large ends of the auxiliary connecting rods and the small ends of all the rods have plain bearings In operation, the Guome motor is ignited by a Bosch high-tension magneto. The shart. The instruction and their men passes through the automatic inlet valve in the head of the cylinder. The inlet valve is most ingeniously weighted by counter-weights to compensate for the action of



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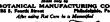
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method of testing employed at the Gnome factory. The finished motor, together with its fuel and oil tanks, is mounted spon a sort of gun carriage, and in place of a propeller a crude paddle type of dynamometer is fitted as shown in Fig. 9. Careful tests are made in this manner before the finished engine is allowed to eave the factory.

Figs. 9 and 19 give a good idea of the

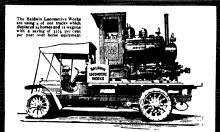
Much has been said regarding the so-called gyroscopic force developed by the rotary engine. To show that this is egligible, Monsieur Seguin took me into the testing room, ran a 70 horse-power motor up to thirteen hundred revolutions per minute, and lifting the tail of the gun carriage (the whole is nicely balanced about the wheels), handed it to me so that I could change the plane of rotation of the rapidly revolving mass. This I did. and unless I made a very rapid movement, much more rapid by a sane aviator would make in flying, the gyroscopic effect was almost unnoticeable. And let me take this occasion to remark that in all of my flights with my 70 horse-power Gnome-driven Blériot monoplaneand I have made in all one hundred and \_I have never seven flights in the machinehad to allow in the manipulation of my controls for the gyroscopic force, muci talked of among "rocking chair aviators." Of course it exists, but I account for the fact that it is negligible in actual practice in that the plane of rotation of the or is not changed rapidly enough to produce a noticeable avroscopic effect.

Now as to the future. As far as I can see from a more or less thorough ac-quaintance with both the rotary and the quantance with both the rotary and the stationary aeroplane engine, the rotary motor will be the better for speed work and where the greatest possible load is to be carried. When several disadvantages of the rotary are overcome I think it will be the better motor for all classes of aeroplane work. In other words, I think a motor of the Gnome type will always be the lightest for the veloped. In this connection let me say that there is an opinion prevalent among aviators acquainted with both types that 50 horse-power from a rotary engine accomplished more in an aeroplane than 50 horse-power from an engine having sta-tionary cylinders. This has been my experience, and I account for the difference in the superior flywheel effect in a rotary engine which is itself an unusually effect ive fiveheel

Summing up its disadvantages, the rotary motor of to-day is expensive to buy, very expensive in upkeep, and will not stand the rough usage which would have little effect upon the more orthodox having stationary cylinders. ree disadvantages may be and prob ably will be overcome in the future, and then we shall have in the rotary gasoline engine the nearest thing to the ideal aero plane motor.

Monsieur Seguin told me, when be showed me through his factory, that he was working on a two-cycle engine, and that he expected to realize one hundred and twenty horse-power with les than in my seventy. If a practical two-cycle rotary motor were evolved, it would be only one step removed from the motor which will undoubtedly be the aero en-gine of the future—the long-sought-for and much-talked-of gasoline turbine; and as an aviator who appreciates the gree advantages of an ultra light but powerful motor, I hope to live to sit behind such an engine.

In America we have neglected the rotary type of aeropiane engine mainly for two reasons. First, it is very expensive to build and few factories have the shop equipment necessary to its successful construction. Second, it is not an easy notor to design. We are thoroughly a motor to design. We are incruiging ac-quainted with the engine having station-ary cylinders from our sutemobile prac-tice, but in the design of a retary motor we enter a new and comparatively unex we enter a new and comparatively unex-plored region. Several sotary engines are new being made in this country, and acon-nic doubt, a thisroughly tested and reliable majory engine aerophics motor of Ameri-



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# The Race for the Harmsworth Cup (Onecluded from page \$40.) first circuit two seconds in the lead, mak-

nest circuit two seconds in the sead, man-ing an average of forty-six miles as hour, the fastest ever accomplished by a motor boat in competition. "Maple Leaf IV" was thirty-two seconds behind. At the finish of the second tap "Ankla

At the finish of the second map "ABREM" Deep" led, followed by "Reliance II," two hundred and twenty yards absed of the English boat. In the race to the outer turn for the third time "Ankle Deep" still led, but "Reliance II" had to stop before the turn was reached. The "Mona" burned out a bearing and had to give up. The contest lay between "Ankle Deep" and the other British boat, with the former three quarters of a mile to the good. "Ankle Deep" was visibly running good. "Ankle Deep" was visibly running away from "Maple Leaf IV," when suddeal) it was seen that "Ankle Deep" had stopped and was gyrating. A few seconds more and it was all over. "Maple Leaf "Reliance II" had blown out two of her

cylinders. When "Aukle Deep" forty-five miles an hour Count Mankowsky attempted to make too sharp a turn at the westerly mark. Her startmard propeller, strut and rudder were literally wrung from the hull into a twisted, shapeless mass. The "Maple Leaf IV," running as smoothly as a watch, covered the course in forty-seven minutes and forty-six sec in forty-seven minutes and forty-six sec-onds, or at an average speed of 43.125 miles per hour, rather better than "Baby Bellance II" did in the first race, but con-siderably less than the burst of speed shown by the same boat in the first cir-cuit, and behind the rate at which "Ankle Deep" was speeding when she met with mishap.

Everyone conceded that, barring accidents, the "Ankle Deep" was the fastest boat. It was also equally syldent that the winning English loat was by far the most reliable of the five contestants. Reliabil-ity won the race and not speed.

This question of reliability did not lie wholly with the engines. From the point of view of mechanical excellence there was little to choose between the various types of motors med on the five hosts types of motors used on the five boats. Under similar ordinary conditions there is every reason to believe that one would prove as reliable as another. The fault was not that the "Ankle Deep" or the "Reliances" engines were not as good as the "Maple Liest I'v.," but that they were not as well installed. Imperital critics of the boats are of the opinion that had been been as the sould be the s that had the installation of the meters been more thoroughly looked after the re-sult would have been different. It is said for instance, that one of the "Ankle for instance, that one of the "Ankie Deep's" shafts was out of sligument and that this was known before the stirred, but that the defect was not considered of ifficient consequence to attempt to rem sumcient consequence to attempt to resus-edy in the short time that was available. It was also stated that the loss of the "ankle I beep" propeller, which cost America the race, was parity due to the ose of too light brone in her propeller shafts. At any rate, the swides strain, added, but Accepted. sparts. At any rate, the sudden strain added to the deviation from all smears was too much for the metal, and it may way. To sum up the mechanical saids of the matter, the British best was looked after more thoroughly, more of ground, than any of the America

Of course, so long as there are course tours, each of the varying a construction, shape of the ball. notes touch, each of the varying, of construction, single of the high her of steps, and so on will have a cates. There is little question. There is little question, that the design of the high little for the manufacture of the manufacture bears in manufacture.



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of either of the British craft. Therefore iding the three new challengers, one of which it is hoped will lift the Harms-worth trophy next year, it is not likely that any wide departures will be mad rom the outlines that have been found o satisfactory.

One other essential lesson has been taught to the American builders by this race. It has been demonstrated that boats under thirty feet in length—the limit is forty feet in the Harmsworth deed of gift of the trophy—cannot hope to succeed except under exceptionally perfect condi-tions of the water. The "Maple Leaf IV" is thirty-nine feet eleven inches long, withone inch of the limit. The "Baby Re-ince II" is but twenty feet long, and the "Ankle Deep" thirty-two. The British craft was more seaworthy, built to take both caim and rough water. The American craft, with some exception in favor of the "Ankle Deep," are wonders in the speed line under perfect weather condi-tions, but when the water grows rough they are almost helpless. This contest ves that America still has the faste motor boats, but that the English are ahead of us to reliability. The new American challengers will have both speed and steadiness of hulls and engines, e ial qualities if we are to recapture the Harmsworth Cup.

Our Enormous Coal Losses
'D'RING the last year, in producing half a billion tons of coal we wasted or left underground, in such condition that it probably will not be recovered in the future, a quarter of a billion tons of coal; we turned loose into the atmosphere coal; we turned loose into the atmosphere a quantity of natural gas larger than the total output of artificial gas during the same period in all the towns and cities of the United States; we also wasted or lost in the mining, preparation and treat-ment of other important metalliferous and non-metalliferous minerals from 10 to 50 per cent of the year's production of such ninerals.'

The above is the startling manner in which Dr. Joseph A. Holmes, director of the United States Burenu of Mines, de-scribes some of the losses in the yearly production of two billion dollars worth of minerals in the United States

The words of the director are a general summing up of a statement just issued by the Bureau, in which an inventory of the various mineral wastes are given and in which the Bureau shows how millions and millions of dollars may be saved to the people of this country through the right

sort of conservation of its resources
The general statement, written by
Charles L. Parsons, chief mineral chemist of the Bureau, contains the charge that many valuable mineral deposits are lying many valuation mineral deposits are typing idle, while the products are being im-ported from other countries Mr. Par-sons further declares that through waste-ful use of certain of the minerals, the ultimate exhaustion and dissipation of ome of the important useful minerals of to-day from the standpoint of the race and in the light of present knowledge, is in sight. He orges that many deposits of ores of such low grade that they cannot be mined to-day should be left in position so that they can be mined in the future. as many ores, formerly of too low gradto work with profit, are now sources of wealth. The wastes of the uset are daily wealth. The wastes of the past are daily being converted into the dividends of the ment, he declares

In referring to the waste in the mining and use of coal, Mr. Parsons says, "The are almost incomprehensible. In mining

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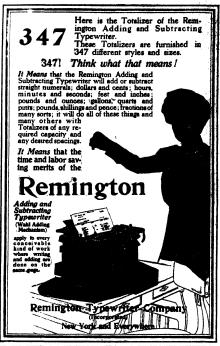
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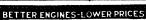
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\$1,009.31 B A Richardson of Haverhill, Mass. a shoc cutter, made his hens pay him \$1,000.51 in 1910, and working at the bench at the same time. How he did it is told in "files-Line Positry Keeping." "SIDE-LINE POULTRY KEEPING"

"SIDE-LINE POULTRY RESERVING"

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over eleven per cent of the energy in coal is being effectively utilized. The remainder of the energy is lost through the inefficiency of the steam believe dynamo.

"It is estimated that the boiler scale to "It is estimated that the boller scale in locomotives alone in this country means a loss of over 15,000,000 tons of coal annually. It has been shown that one six-teenth of an inch of scale means a loss 25 per cent in boiler efficiency. entific control of the combustic coal under boilers is constantly increas-ing, but the losses of carbon that is still pouring from our chimneys, defacing monuments, buildings and landscape are without valid reason.

without valid reason."

Mr. Parsons says that the losses in
making of coke by the old-fashloned
process wasted \$40,000,000 in the United
States last year. He calls this an entirely needless and seemingly ruthless
loss. He declares that these coke overs, without taking into account the value of the by-products that were possible, wasted more than one million horse-power in the year. All this loss might be prevented by the use of modern methods, he says.

"The dust from stacks and chimneys of all kinds," says Mr. Parsons, "is often not only a great waste of valuable ma-terial, but is one of the great evils of modern civilization. Valuable metalliferous dusts are strewn broadcast from the stacks of our smelters; gases and poison ous solids destroy vegetable and animal life; and masses of black smoke pour from our chimneys and settle in clouds over many of our cities, rendering them exceedingly disagreeable and unsightly. Even with present knowledge, practically all dust nuisances are preventable, and legislation the country over is diminishing the dust output from smelters, cemen plants, and from smoking chimneys, often with the result that the collection of dust incident to smoke prevention become source of profit.

"Almost inestimable losses of sulphus arsenic, and bismuth are now taking place in the fine dusts and fine gases.

proportion to output the losses of sine are probably greater than tho any other metal, and are especially im-portant because there is almost no recovery of sinc from manufactured products and almost no conservation of zinc by ac cumulation. Besides these losses in the mining and concentration of sinc ores there are incalculable losses, which with ut question run into many millions of collars and undoubtedly exceed the total waite products from other processes.

Zinc has been and in general still is considered about the worst impurity to be found in the ores of copper and lead, for it has always given trouble in their metallurgy.

"In combined, but unfortunately in rela "In combined, but unfortunately in season tively insoluble form there are unlimited supplies of potash in this country. Because no methods are known for economically obtaining the potash we are obliged to import from Germany about \$15,000,000 worth each year. Potash is absolutely essential, and unless methods can be found for obtaining it from domestic supplies, we shall be obliged to pur chase it from Germany at a price at 400 per cent more than the cost of deliv-

ery in New York.
"Our waste of nitrogen, worth in com bined form about fifteen cents per pound are almost inconceivable, and no calculation can give us a real idea of what thes losses mean. Although we produced last year over 406,000,000 tons of bituminous coal, we recovered only \$3,800,600 worth of the \$160,000,000 worth of recoverable nitrogen in the coal.

"Of course, it is entirely impracticable under present conditions to recover as am-monia all of the nitrogen that might be obtained, but it does seem most regret table that of 63,000,000 tons of coal con-verted into coke in 1910, containing \$22; verten mic cose in 1919, committing state of 000,000 worth of recoverable nitrogen, only about one eight was treated in eventy or retorts which could make that necessary possible. The rest of the nitrogen in the



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al went off as free nitrogen in the air this estimated that since the first by-product coke oven was built in this coun-try in 1893, and up to the present time. he coke coked in the old-fashioned beehive ovens where the nitrogen was ruth-lessly wasted in fire has amounted to about \$10,000,000 tons. Had this been about stations, or that this been coked in by-product ovens the volatile nitrogen of the coal would have yielded twenty-three pounds of ammonium sulphate per ton or a total of 9,315,000 tons, which at \$60 a ton would have had a value of \$558,900,000. But this would not be all. Had this ammonia been recovered, it would have been used on the soil as a fertilizer and the crops would have increased fully 20 per cent, and the saving would have been many millions

"The waste and the utilization of sul phur are both enormous and depend largely on local conditions. We produce sulphur cheaper than any other country in the world, sell it at perhaps the highest price, and in the form of sulphur diox ide discharge it in the air from the stack of a single smelter in quantities aime as large as those utilized throughout the country from sulphur and domestic pyrite put together. If the sulphur discharged into the air from this one smelter wer converted into sulphuric acid it would furnish more than enough sulphur acid for the total fertilizer industry of the United States This country is producing annually about 3,000,000 tons of sulphuric acid-the basis of all chemical industryof which approximately one half is u in the manufacture of fertilizers. The total amount of sulphur dioxide dis charged into the air in the country would unquestionably suffice to make more than 8,000,000 tons of sulphuric ccid."

#### The American Road Congress

THAT not less than \$250,000,000 would be saved to the country in the co hauling the present record breaking crop if 20 per cent of the public highways of the country were improved, is the as tion of J E Pennybacker, Jr., executive secretary of the American Road Congress which is to be held in Atlantic City September 30th to October 5th. Mr. Penny backer, before becoming the secretary of the American Association for Highway Improvement, which, with the American Automobile Association and the National Association of Machinery and Material Manufacturers is holding a convention at Atlantic City, was the chief of the Road Management Department in the United States Office of Public Roads, has made a comparative study of the cost of hauling crops over good and bad roads.

In an interview Mr. Pennybacker said

that it will be merely a matter of a few years before 20 per cent of the public highways of the United States will have been improved. At the present time little over 8 per cent of the public highways are of the improved type.

"The Governments' prediction that the crop now being harvested will exceed any previous year's yield," said Mr Penny-backer, "should serve to call attention to the great losses that are being sustained by farmers and consumers in the hauling of crops. It is estimated that the improvement of the main roads of this country, approximately 20 per cent, would result in an annual saving of at least #250,000,000 in the cost of hauling alone which would be sufficient to improve which would be sufficient to improve 80,000 miles of road at a further cost of 80,000 per mile in dwe years this would improve 250,000 miles, which would be sufficient to bring the total mileage of improved roads up to 20 per cent. "There are more then 25 000000."

There are more than 25,000,000 farm horses and mules in the United States, horse-s and mules in the United States, valued at \$2,700,000,000; about 1,500,000 horse-drawn vehicles valued at \$88,000,000, and more than 450,000 automobiles valued at about \$500,000,000. A depreciawater the Harvin Safe Co.

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facts. Once the people realize the great waste involved in had roads, there will be little delay in the improvement of the main arteries of commerce throughout the

## The Antiquity of the Raingage

WHEN and where was the raingage invented? ascription of this invention to Benedetto Castelli, in the year 1639, is far indicating the real antiquity of the instrument was pointed out in the SCIENTIFIC AMERICAN of December 24th, 1910, p. 504. In the same connection it was noted that the great im-portance of rainfall in its relation to ricegrowing led to the construction of rain-gages in Korea as early as the year 1442 A. D.; while a much earlier use of the in-A. D.; while a much carrier use of the in-strument—in response to agricultural re-quirements in Palestine—described in the Mishna, carries the history of raingages back to the first century of the Christian

er contribution to this subje published in the Quarterly Journal of the Royal Meteorological Society for January, 1912. The writer, Jogindra Nath Samma-1912. The writer, loginara Nath Samma-dar, quotes some pertinent information from a book entitled "Arthastra," or "The Science of Politics," written by Chanakya, the famous minister of Chandragupta, the founder of the Maurya dynasty in India. and duting from the fourth century B. C In the chapter on the "Superintendent

of Agriculture" this early work states "The quantity of ruin that falls in the

country of Jangala is 16 dronas, half as much more in Anupanam countries; 1336 dronas in the country of Asmakas (Southern India), 23 dronas in Avanti (Konkan); and an immense quantity in Apparantam (western countries), the borders of the Himalavas, and the countries where waterchannels are made use of in agriculture.
When one-third of the requisite quantity of rain falls both during the commencemen and closing months of the rainy season, and two-thirds in the middle, then the rainfall s considered very even "

These explicit statements certainly point to the fact that some form of raingage wa known in India as early as the fourth century B. C. As to the drong, the writer only rells us that it was "a cubic measure; hence, even if we knew its value, we should need also to know the surface area of the raingage in order to interpret the statistics given above, whereas modern statistics of rainfall, in linear measure, are independent of the dimensions of the gage.

on the dimensions of the gage.

Another passage in the same work seems to indicate that ancient Indian meteorology used a classification of cloud forms much more elaborate than any we have to-day

"Three are the clouds that continuously rain for seven days. 80 are they that pour minute drops; and 60 are they that appear with the sunshine."

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ehicles In connection with this Department a Information Bureau will be conducted, which the Editor offers unbiased advice to those who are concerned with motor transportation, and will endeavor to anwer as completely as possible any qu tions that may be put to him relating to mechanical features, operation and management of commercial motor vehicles first issue of this Department will appear in the SCIENTIFIC AMERICAN of Sep



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cess premium for insurance, amounted to over \$456,485,-000, a tax on the people exceeding the value of the gold, silver, copper and etroleum produced in the United States in that year.

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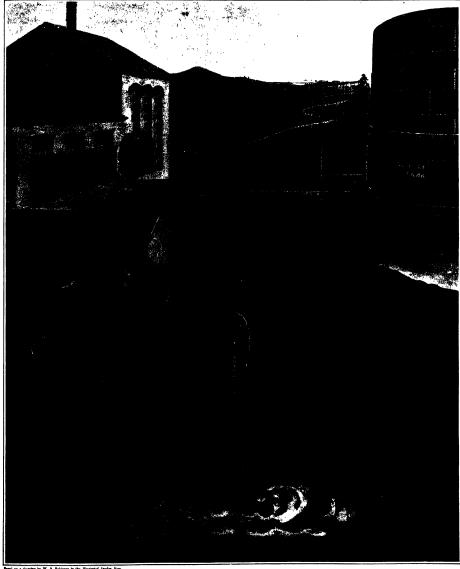
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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and sudustrial achievement.

#### A Promise Unfulfilled

HE failure of America to send a single machine across the line in defense of the Gordon Ren-nett Cup, proves that in spite of the brilliant work which has been done by individual Americans in promoting the art of aviation, as a nation we are lagging deplorably in the rear When the winning French machine swept in faultless style over the course at Chicago, with not a single American entrant in the air to dispute its victory, the thoughts of some of the spectators must surely have gone back to that memorable day among the sand dunes of Kitty Hawk, when an American mechanic left the ground in a power-driven machine, and achieved the seemingly impossible by making a clean cut flight of one half a mile through the air

In some future age when aviation shall have been established as one of the accepted means of transportation, when the problems of starting, alighting and automatic stability have been fully solved and travel through the air shall have become as safe if not safe: travel by rail or sea, the man who sits down to write the story of the development of high-speed trans portation, with its long record of brilliant achievements will undoubtedly place at the head of the list that first successful essay of the late and ever-to-be-lamented

Without custing the least reflection upon the admirable work done by European experimentalists, it can be truthfully said that the work of Changle, Langley, and the Wright brothers has established beyond all disputation the right of America to be named as the birthplace of the most difficult mechanical feat ever

Having made such a notable start, America, by all reasonable expectation, should have continued to lead the world in the development of the new art. We are an ambitious and strongly competitive people; highly inventive, possessed of an inborn mechanical genius; and abundantly equipped both with facilities for lab-oratory experiments and with the necessary capital for development. Nevertheless, it is a lumentable fact that pre-enthence, both in the construction and dying of neroplanes, passed at an early stage to Europe, where it has ever since remained. How far we have failed to fulfill our first great promise is shown by the recent flasco of our attempt to defend the world's greatest aviation trophy

Simple justice calls our attention to the fact that the present situation is due to causes national rather than individual. The two indispensable aids to development after the first start had been made, namely, gov-ernmental encouragement and the assistance of capital, have both been markedly absent. A certain amount of Federal aid has been extended, it is true; but in view of what is being done abroad, it must be admitted that it has been pitifully small. As for the advance-ment of capital, all that can be said is that if the financiers had shown one tenth of the cuthusiasm and courage which have been manifested by individual inventors and experimentalists, we could easily have ventors and experimentalists, we could easily have maintained the proud position which was won for ma-by the patience and seal of the Wright brothers. Furthermore, outside of those highly-to-be-co.amend-ed individuals who have not hesitated to emberk

their time, labor and all too-siender means in the development of the asymptome, there has been a strange lack of public interest in the subject. Beyond going numbers to witness the spectacular feats of a few airmen at the aviation meets, we seem, as a people, to have been perfectly content to mark time and watch the European nations turn to practical and

national advantage what we have so well begun.

The insignificant position now held by the United States in practical aviation was strikingly shown by the Hon. William G. Sharp, in a recent speech before the House of Representatives:

"If I were to use a blackboard at the front of the clerk's desk and tilustrate in another manner the relative extent of our development as compared with that of other countries in this most important work, I could draw a line at least 3 feet in length to represent the position of France, and then away down at the bot tom, after such countries as Austria and Italy, I would have to draw one, not exceeding an inch in length resenting its growth in the United States. Or, ogth, rep-Or, if I were pictorially inclined and wished to draw upon that blackboard a modern seroplane and give to it a width of plane of 3 feet, representing the seroplane strength of France, taking up almost the entire size of the blackboard, I could fairly represent the relative position of the United States Government by pinning upon it one of the smallest butterflies that you may see playing about the Capitol grounds.

"Perhaps a better way of putting it in a dollars-

cents aspect would be to say that we appropriated, as you gentlemen remember, in a bill reported the Committee on Military Affairs, \$75,000 for the construction of aeroplanes for the Army for the ensuing year. For a like period France contributed over \$4,000,000. Germany came a close second; and then England, Italy, Austria, Russia, and one or two others of the smaller powers.

Our lack of practical interest in aviation may be explained on several grounds. The slight degree of assistance rendered so tardily by our Government may have been due to an over-develop ed conservatism; the failure of capital to interest itself may have been due to a conviction that the time had not arrived when investment would give any reasonable prospects of profitable returns. But the failure of the public at large to interest itself greatly in aviation as a sport is perplexing. We are strongly imbued as a people with that competitive instinct which is essential to the development of sport. We follow the fortunes of our athletes at an Olympiad with the keenest and turn out en masse to welcome them on their victorious return. We squander millions in the defe of a yachting trophy, and spend hours in watching a couple of yachts contest in slight and drifting winds an international cup; but when it comes to the defense of a trophy which represents the highest schlevement in an art whose genesis was due to our own persoverance and ingenuity, we stand supinely by and allow the prize to be snatched from our n without making any adequate effort to defend it.

Perhans some of the readers of the Sciences American can offer an explanation of this anomaly. We shall be pleased to throw our correspondence columus open for a discussion of the subje

## The Steel Rail

F we were asked to name the one product of the foundry and rail mill which is called upon, in its dully service, to perform the most exacting and destructive duty, we should select offiand the steel rail, and particularly the American steel mil—for it is certain that in no country of the world is this over worked member subjected to such violent usage. Act ing as a bridge to carry the wheel loads from tie to tie it must endure bending stresses such as no engineer would dream of imposing upon a plate girder or a truss bridge. A reversion of stress in any member is notoriously trying and destructive; yet the steel rail (especially if the track is not in first-class condition) is subjected to reverse stresses of the heaviest characis subjected to reverse stresses of the heaviest character. So complicated are the forces which act upon the rail, that their exact analysis would defy all the skill and apparatus of the most complete testing lab oratory in the world. Stresses of compression, ten-sion and torsion follow each other in swift succession. and they are frequently acting at the same time and in large quantities in any given length of rail. Finally, as if this were not sufficient, the rail itself is treated as an anvil and subjected to a fierce pounding wh hammer blow is often sufficient to flatten it down, if indeed it does not break it clean in two.

Now, one would expect that a member which is to be subjected to such severe uses, upon which is imposed such exacting duty, would receive every assistance that careful selection of the materials of its composition, and patient carrying out of the processes of manufacture, could afford. But manufacture, the demand for steel ratio is so commons, and often so very urgent, that there has been a sense temperation for the manufacturer in selection guarantee output. Processes for which, if the product is at here liable, time and patience are an absolute measuring, he here "speeded up." The result has been "speeded up." The result has been igned up. "and the product in the production of the wonders of modern infiniters." But there is not the wonders of modern infiniters. But there is the the product in the product of the wonders of modern infiniters. m another result just as marked, and that has been the depreciation in the wearing quality, etrangth and general reliability of the rail.

The recent meeting of the International Testitution for the Testing of Material has shown how fully those for the Testing of Material has shown how fully disas-facts are resident and how cernestly ampliances the world over are seeking for the proper remedy—the res-sonable compromise. Reliable ratio can be predicted for a reasonable price to the ratificed, and at a remes-able profit to the rail mills. In an early issue we are pect to publish further letters in addition to those which have appeared on this subject, and shall ester into a more complete discussion on the causes and remedies for the present conditions.

#### The Atlantic Inland Water Route

F we do not hear so much in these days about the military advantages of the proposed Inland Water Route along the Atlantic Coast, it is not because those advantages are any less real, or any less, that they were some years ago, but rather because the gree nercial advantages of the scheme are bec ingly evident.

In the event of the blockade of the Atlantic and Guif ports and harbors by a superior force of the enemy, there can be no question that the existence of an interior water route, linking together the blocked points and putting them in water communication with one another, would have an important bearing upon the situation. The waterways, which would generally be situation. The waterways, which would generate to far enough inland to be removed from attack by the enemy, would make it possible to concentrate a pow-erful fleet of destroyers and submartness at any selected point on our coast line, and the concentration could be made with such absolute secrecy that the enemy would be in ignorance of the point at which the was planned and could make no special provis

It is as a commercial proposition, however, that the proposed waterways call most strongly for recognition and support. Not only will the transport of freight, because of the sheltered character of the route, be accomplished with greater safety, but there will be an in-evitable and considerable lowering of transportation rates as compared with those that obtain over the t routes by rail.

In his recent address before the Atlantic Desper Waterways Convention, Mr. Acker, the president of the Philadelphia Chamber of Commerce, pointed out that the new route will enable manufacturers in New England to procure their coal and their cotton from the South and send their manufactured products to New York, Philadelphia, Baltimore, and other important points along the proposed route at lower through rates than at present. Furthermore, the claim is well made by the advocates of this scheme that its completion will surely stimulate the interchange of commodities along the whole line of the proposed route. Centers that are now separated by geographical co tions which render the interchange of trade difficult and suppositable will be provided with the changest known method of transportation; and it is perfectly reasonable to believe that the towns and cities contiguous to or within easy reach of the waterways will be commercially greatly benefited.

We heartily agree with Mr. Acker that there is no necessary antagonism between rail and water transno necessary arragonses netween rati and water trans-portation interests. On the contrary, if they are prop-erly regulated they are complementary to each other. With intelligent regulation, heavy freight in bulk will be carried by water and the lighter and fast freight by rail.

# An Automobile Repair Shop for

An Automobile Regair Shop for Acrophanes

N automobile of nonewhat curious design is being put in use for the acrophane service in the Prench rany, and it forms a restable machine shop for matting all the needed repairs spon secondance. No doubt it will prove valuable from the fact that it can be quickly brought to the spot whiere an acrophane in a disabled condition may require in help it has the single of a large covered power wages with motor and divers' sent in front. An obsertic instinctional for the sent of the car. The inside spece gives recent for a sumber of tools such as a large said an energy grinder, both driven by electric motors, disc a postale fromes and acrophane's and merchanics's sending with 100%. Ampliane pieces can be receiffy impained. and ever in pieces and acrophane is the send as the sending in some characteristic sending in the sending in the sending in the sending in the sending 

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Some Standard March Under Fra.—It is uncollectly recorded that the desistion must which was exceed on the diff Sizes Alexander for the translations to grant fire, stood up associately well under hombardment by large gran and march that radiiled the thoriton on which it was built. We loops to give official particulars at a later date.

are nops, to give output, partnerses at a nature date.

Latest "Germann Bastle Center—The latest German

latests ertiter "Groeben," during her recent forced,
daught strial, maintained for serveral hours a speed of

28.68 houts. This vessel is a sister skip to the "Moltic,"
which resourtly tristed this country. The "Moltic,"
since her going into commission, has made slightly over

28.88 houts: therefore it is reasonable to suppose that whom
her machinery is dashen down the "Goeben" will equal

Rassian Head of Material Testing Association.—The Sixth Trienzhial Congress of the International Association for Testing Materials, before adjourning, eleoted as its new international president, N. Belchibsky of St. Petersburg, who is the prefessor emeritue of the Inativate of Engiaesis of Ways of Communication of the Emperer Alexander I. The Congress decided in honor of the Russian sejentist to hold its next international conference in St. Petersburg in 1913.

Columbia University Research Department.—In connection with the recent gathering of the Association for Testing Materials it was announced that a large gift had been made by Edward W. Browning for a research department, which will establish testing laboratories similar to those maintained so successfully by the German government, whose scope of work will take in\_asyline from a sheet of writing paper to the material for a modern gun. This is good news which will be welcomed by every prectical estentist and engineer throughout the country.

Auxiliary Sailing Scheeners.—Mr. George Westinghouse is strongly of the opinion that the typical American silling scheener of many musts has a great future before it in the ocean-carying trade, provided that it is equipped with auxiliaries. He believes that the best auxiliary will be a 750 horse-power utrition provided with reduction gear, such a plant being suitable to a 5-masted schooner of 5,000 tons. He believes an average speed of eight knots is preciseable and that the economy would be such that these vessels would excel the typical tramp steamer as an economical freight carrier.

The "Half Moors" is the Hudson.—Those of us who are interested in historical rolles will be glad to learn that the "Half Moon," which was presented to this country by Holland during the Hudson-Fulton celebration, has been given a permanent anchoracy opposite Younkers in the Hudson Rivier. The little craft has been thoroughly overhauled and put in first-dess condition; and it is sincerely to be hoped that this most interesting vessel will continue to reserve the constant care which its intrinsic value as a faithful replies of Hudson's ship and as a gift from a friendly government, demands.

Bedsinting the Jersy Meadows—The members of the American Peak Society, which recently beld its usmusl covenition in thosty, valided the Jersey meadows with the properties were thanked across of peak long that the being redsimed and outlivated. After eight pair of devolopment some two bundered across are yielding, in lettuce and outlone, from 600 to 1,000 bushels peaces, while the pield of celery is said to average about 3,000 does per across. The results obtained in this locality should prove a great estimation in diffusion work of redsamation on valuable but undeveloped bog lands throughout the country.

To Safeguard Life and Limb,—The Allegemeine Electricitates Gesellschaft of Berlin has cabled President Arthur Williams of the American Museum of Safety, that the Rathenau Gold Medal has been placed at the disposal of the Museum, for award annually for the best davise or process for safeguarding life and limb or promiting health in the electrical industry. The compatible is open to 8 very country in the world, but the device or process must be eachlitided at the American Museum of Safety in New York etty. We congratulate the American Museum upop his distinct European recognition of the very good work is in doing.

Assismateally Reserving Sée Temperatures.—The superintendent of the Johns Mepfire Botanical Gardens, william H. Witte, has given to the public bit inguisous plans for automateally reporting changes in see semperature wises a skip in juning skrough the low fields. Water flower through a small lank in his bow of the vessel, in which three distinct significances serve to record the changes of semperature. These include a high and low their consistence in the second section of the changes of temperature drum, and sectes of tubes filled the ship and the second section of the changes of temperature on a surveying drum, and sectes of tubes filled ships with a tube being connected by a small shipsis Milled pipe with a displaying connected by a small shipsis Milled pipe with a displaying connected by a small shipsis Milled pipe with a displaying connected by a small shipsis Milled pipe with a displaying which through a second of the pipe ship and the pipe ship and the second of the second of the pipe ship and the second of the second of

#### Electricity

Misctre-hydraulic Steering Gear for Vessela.—The general utilization of the electric light on board large vessels invites the replacing of steem steering gear by an electric motor-driven gear. In an electric gear recently developed an intermediste system of hydraulic sylinders protects the motor from the mechanical shock of waves upon the rudder. The motor runs continuously, driving a special pump the flow of which can be instantly stopped by the steerman or directed to either of the two hydraulic sylinders operating the rudder.

Aluminium Conductors in Winter.—One of the arguments directed against the use of aluminium for transmission lines is that, in winter time, they will collect a thicker coating of ice and snow because of their large diameter and, hence, will sag more than the copper wire of equal carrying capacity. A writer in Elektrochnische Zeitzup believer that this contention is based on a fallacy. He has found that in Norway the copper telephone wires of 4 millimeters (0.164-ind) diameter become just as thickly coated as the aluminium cables of 300 square millimeters (0.46 square inch) section.

Fresing the Hands in Telephoning.—In using the telephone one's hands are tied by the necessity of holding the receiver to the ear by the left hand and by the habit of picking up the ordinary deak telephone set in the other hand. A British inventor has devised a simple arrangement for freeing both hands and thereby saving time. In 'holding the line' one places the receiver on a platform which present the earpiece against the small end of a sound-magnifying trumper. The trumpet—not unlike a fastened motor-our horn in shape—talks out into the art, enabling one to hear while leaving both hands free for looking up references or filling the waiting time in any other way.

Electric Miners' Lamps.—A recent English government competition for the best electra lanters autable for miners' use has brought out several creditable harmond designed to most the rather difficult specification imposed. One of the prize-winning lanterns is so well on compiletely gas-light (to avoid all rake of igniting fredamp in the mine by an electric spack at the switch) that the lantern may be used under water if nocessary. All contacts are made inside the case. Carriel construction of the lantern as a whole and of the disriple storage cell whole furnishes the current for the disriple storage cell whole furnishes the current for the construction of the lanter mas a whole and of the disriple storage cell whole furnishes the current for the mass of the construction of the lantern as a whole and of the disriple storage cell whole furnishes the current for the mass of the construction of the lantern as a whole and of the disriple storage cell whole furnishes the current for the mass of the construction of the lantern as a whole and of the disriple storage cell whole furnishes the current for the mass of the construction of the lantern as a whole and of the disriple storage cell whole furnishes the current for the mass of the construction of the lantern as a whole and of the mass of the construction of the lantern as a whole and the second and the construction of the lantern and the construction of the lantern and the construction of the lantern and the lantern and the construction of the lantern and the lant

A Powerful High-tension Electrostatic Machine.—A large 20-disk influence machine capable of generating potential differences up to 323,000 volts has been built in Paris for experimental work on high direct-current potentials. This machine is designed for strength, permanently good insulation and freedom from vibration in running, and in appearance severs of the commercial rather than of the experimental. The ten pars of sobnite disks, 73 continueters in diameter, are rotated in opposite directions at 1,500 revolutions per minute by individual belief from an electre motor-driven man shaft. Any disk may be withdrawn very readily for the impection and electric motor-driven man shaft. Any disk may be withdrawn very readily for the impection and obscuing necessary to keep the machine in working order to give its maximum output.

Diffusing Bulb for Tungsten Lamps.—Owing to the various methods have been tried to diffuse the light either by frosting the bulb or by using a shade or globe. Such means, however, have the defect of absorbing a large proportion of the light. A patient has been recently granted to Mr. Fener Cooper Hewitt on a lamp bulb formed with parallel longitudinal grooves in the outer surface. The lamp is thus formed into a myriad of long narrow prisms which diffuse the light so that the entire bulb seems to be agiow. The light of the filament being spread over a large surface is not so painful to the eye. At the same time practically more of the light is loot as in the case of the frosted bulb. The lamp bulb is grooved by stoking the glass with kydrofusic acid.

Conductive lak.—Two patents were recently granted on ink which is electrically conductive when dry. The inventor, Mr. H. E. Goldberg of Chicago, has discovered that metable in the colloids form in a volatile liquid may be used as Ink, and that when spread upon the surface and the volatile element has evaporated, there is left a metable layer which is continuous and electrically conductive. Many metable such as silver, gold, platinity and oppys, whose graphite, may be rendered colloided by forming a direct current are under water between terminals commisting of the metable. The metal is no finely divided as not to precipitate under the action of gravity from the liquid in which it is diffused. The various notates produce different colored inks. Silver colloid will precibe gold colored marks or even grass green. Colloided graphite produces black or grayish black marks, but is not a selectically conductive. By combining silver and gasphites an Ink is obtained which is substantially black sead has good standardivity.

#### Science

Prof. Francois Alphonse Forel died at Morges, August 7th, at the age of 71 years — To the world at large he was best known as an authority on the Swiss lakes—especally Lake Geneva—but his investigations embraced a wide range of subjects in physiology, zoology and geology

Coffee Without Caffein.—The American consul at Tamatave, Madagasear, has sent to the Bureau of Manufactures in Washington samples and photographs of a natural caffein-less coffee growing in that island. I so locally known as "mantaska" or "caff sauvage," grows to a height of 12 to 20 feet, and resembles the ordinary order tree, but has smaller leaves and a yellowish herry

Black Opals are commonly the result of artifletal coloring, but true black loads have been mined in a small district at the head of the River Darling in northern New South Wales during the past mine years. The output was at first very small, but for a few vears amounted to 30,000 to 40,000 per annum. At present, according to a consular report from Adelaide, they have become extremely rare, hardly any having been found during the last nine months.

The Brahmaputra Expedition, recently undertaken by the Bratish authorities in Indu to punish the Abor trhesmen for the murder of Commissioner Williamson, has not yielded all the geographical information that was hoped for, as it was not found possible to explore all the unknown portion of the Brahmaputra-Brangen Mowever, a total of 35 square miles was surveyed, maternally reducing the unexplored part of this territory, and much other seizentific work was accomplished. Incidentally, the attempt to chattes the Abors was a failure.

The Royal Geographical Society, generally recognized as the foremost organization of its kind in the world, is about to omerge from the cerpievellar purhous of Savide Row, and take possession of a fine residence facing Hyde Park. The Society has bought Lowther Lodge, with two acres of grounds, having frontages to Prince's Gate and Kennington Gore. Here it will have most of the accommodations of a first-rate risk, and room for the growth of its splendid library, map rooms, etc.

Dust from the Tail of Halley's Comet, according to Marchand, of the Pred Mridt Observatory, a responsible for the coronas that have frequently been seen around the moon in perfectly clear weather ever since May 190th, 1911. It is well known that the angular size of a corona depends upon the size of the solid or liquid particles in the air which diffract the light, the smaller these particles, the larger the corona. M Marchand's measurements indicated an average diameter for the dust particles of from 20 to 30 merons shortly after the passage of the cornet's tail through our atmosphere. Since that the size of the particles has decreased to about 0.5 microns.

Easter Island, Jymg 2,000 miles west of the South American coast, in the South Pacific Ocean, has been ever since its discovery by Europeans, a most interesting archinological puzzle on necount of its colosest stone statues, rumed stone houses, and other remains of an unknown race. Petermanna Mittellungen reports that a fresh attempt to solve the mystery of these remains has been undertaken by an English sportsman, W. Scoreshy Routledge, who is proceeding to the island on a motor yasht, accompanied by a geologist and an arel seologist from the British Museum.

Topographic Maps of Counties.—The well-known Topographic Maps of Counties.—The well-known Topographic Atlas sheets of the U. S. Geological Survey, which will ultimated cover the whole of the United States, divide the country into regular "quadrangles" having no relation to jointeed boundaries. As there is, however, a demand for county maps of the same general character, the Survey has begue experimentally to issue such maps. The first of the series, recently published, is of Jefferson County, Kontucky. The area was surveyed in co-operation with the Geological Survey of Kentucky. The county is very irregular in ahape, and includes parts of the areas shown on six "quadrangle" sheets of the Topographic Atla

Magnesis Reds as a Substitute for Platinum Wire in the Chemical Laboratory.—The increase un the cost of platinum has forced the chemist to look for a cheaper assistance of the chemist to look for a cheaper assistance of the Chemister of the Che

## The Mile-a-Minute Boat

It seems the front of fate that we should have had to relinquish the Harmsworth trophy for the speedies boat of the year just two days before one of our own basic established a world's record for speed, raise that record close to the miles-minute mark. However, even had the "Tech, Jr.," been able to compute in the international contest, it is not at all certain that she would have won the trophy for the reason that

it was reliability rather than speed that gave the cup to the "Maple Leaf IV." Her best speed was exceeded by other borts which, however, failed to maintain their good showing throughout the races.

The "Pech, Jr.," owned by Col. T. Coleman do Poul, is a small hydroplane, 20 feet long, equipped with a 50 horse-power custage. In the context for the Booch troubly for the world's one-mile champion-sidp, tied on Friday, September 6th, site mode the first mantical mile in 1 minute 111/5 seconds. This be september 6th, site mode the first mantical mile in 1 minute 111/5 seconds. This does not be set in the mode by the boot, and the record was made on a rougher sea than was encountered during the race. The time for the other five miles was, respectively, 2081/5, 1-10/15, 1-334/5, and 2-384/5, making an average of 33:39 kmots, or 18:48 statute miles per hour. Her speed thus fell to a low flaure over a longer distance.

The other contestant of the trophy was the "Baby Reliance III," whose best mile was done in 1 24, or 42 45 knots, and her average was 30.98 knots, or 35.68 statute relies.

Our photograph shows the "Tech, Jr.," being driven at full speed over the course. Her planes have raised the fore part of the hull clear of the water, showing the raidder, which is placed well forward, lifted well above the water.

## Light Made Audible By P. F. Mottelay (London)

THE interest which was widely displayed in Mr Fourniter d'Albe's new invention at the time the orizinal model was first submitted to members of the Royal Society in London, some mouths ago, has been intendified by the exhibition recently made of the improved apparatus at the optical convention in South Kenshuton

The new apparatus actually enables the totally blind, among other results, to locate accurately any window or open bright light, to discover readily the shadows of odjects usseling between them and the light, to discover variations in light such as are produced by clouds usually over the sun, and to locate brightly illuminated sobiets, such as, for instance, people drossed in white The action of the instrument is based upon the

The action of the Instrument is based upon the peculiar property of solenhim or channing its electrical conductivity under the influence of light. This property is utilized for producing an electric current, which is interrupted by a special clockwork interrupte, and so made auditie in a relephone. Thus the eye is replaced by the our as a detector of light

The haproved hostrument is a differential one, and make as shown in accompanying diagram, contains two sensitives selection surfaces, which form two of the resistances. It is specially designed to indicate contrasts, and is, therefore, best adapted for discovering objects, and is, therefore, best adapted for discovering objects of the linearity of the light, though the brightest light naturally gives the quickest and most certain indications.

It consists of the camera-like box, ten inches long, three factions while and four inches deep To work it. It is necessary only to attach the telephone to one ear by means of the head-band, which latter

should be slipped over the top of the head so as to hold firmly and enable the hands to tenuin free. The clockwork is then wound up by means of a small handle and a rod is moved along the slit until a purr ing sound is heard in the telephone When this is the case, the iris diaphragm is closed down to its smallest size and the optophone is pointed (us one would a camera) toward some region of the open sky-though not to the sun, of course. The rod which controls the wire resistance should thereupon be moved until the purring becomes as faint as possible, should, however, absolute silence not be obtained in this way, the sliding lid must be opened and the carbon resistance adjusted until perfect silence is procured The instrument is now in its most sensitive The passage of the hand or other object across the aperture is indicated by a purring sound, the loudest sound indicating the passage of the edges, where the contrast

is greatest. The full effect takes a few seconds to develop, and show movements are, therefore, more easily discovered that rapid ones. In a bright light, however, even the swiftest shadow is discoverable. Prolonged exposure to a bright light "blinds" the optophone just as it blinds the human eye, and some repose is required to let if regain its sensitivoness for faint light. In feeble light, the iris disphragm should be open to the widest extent. A gentlessan who tried the opto-



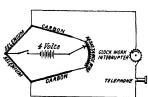
Running over the water at 58 miles per hour.

ishone found that a glimpse out of the window sounded like a cinematograph reeling off a film. The ticking sank almost into sdience as the receiving tube was held in the shadow of the table, and leaped into a lively rattle when placed against an electric light bulb.

rattle when placed against an electric light bulb.
If you are blindfolded and place the receivers to
your eurs, and a place of blotting paper is placed between the box and an incandescent lamp, you hear
a ticking or grating sound; in fact, you hear the
shadow pnessig.

On a moonlight night you hear the moon, while the summer sun makes a tremendous noise like a cataract. The optophone can locate the light of stars invisible through the telescope.

The telephones used are similar to those employed



Principle of the optophone.

for wireless tolography, and are capable of detecting a current of a quarter of a micro-ampree when inter-rupted by checkwork. The carbon resistances are 1,000 to 2,000 ohms each. In the new differential optophone, two scientum cells are balanced against two carbon resistances in a Wheatsone bridge arrangement. When therefore the two arts of the resistances in a Wheatsone bridge arrangement. When bright or dark, there is silence; but when the image of the edge of a bright object falls upon the line dividing the two scientum cells, one of the latter is illuminated while the other is in darkness, and the contrast thus secured gives a striking indication of the whereabouts of the edge. This is what the stone-billid want thus are the side of the edge. This is what the stone-billid want to find micro-find want to find micro-find want.



Interior of the optophone, show-



Mr. E. Fournier d'Albe with his

The Mahagua Tree as: a floarree of Phase."

The mallow family (Molecones) to which the colds man cotton plant belong, includes a large amanise of trees and shrubs yielding valueble hast filter. Mahagua or mahoe (Pertilim Hillocome Ad, Juse.) in perhaps the most important member of this ground. All the species of the genus Pertilion, of which there are over twenty, yield fiber, for cordage and the purposes. While all of them produce a value other morroose. While all of them produce a value other morroose.

the majority are of local use only, and the mahagua is the only one that is available in sufficient quantities to be worthy of the attention of the large trade. It furnishes a strong and festible fiber comparable to jute, and has the remarkship quality of becoming stronger by long maceration in water.

The mahagus is a shrub or sometimes a rather large tree widely distributed, and is very common in all tropical countries, where it has been planted and escaped and now grows wild. It is a native of the West Indies and grows abundantly there. The tree was introduced into India very early and now is common on the Malabar coast, and is called bols by the Bengalese. It is also common both in Dant and West Africa, where it is cultivated in a good many gardens, because it is regarded as a very desirable shade tree. It is believed to

have been cultivated for its fiber in tropical America before Columbus discovered the Western Continent.

Considerable quantities of this fiber have lately been exported from parts of India to England and United States, where its use is constantly increasing. In India it has long been used to adulterate jute and hemp, which it resembles, and has been imported into France for use in the manufacture of high-grade paper. The fiber is white or grayish yellow, fine, silky, strong, pliant, slightly lustrous and somewhat lignifie average length of the fiber is about five millimeters and about 16 micra in diameter. strongly thickened and the cell cavities are very small. According to Roxburgh the breaking strength is greater than that of the fibers of a majority of other textile plants. The mahagua fiber possesses unusual durability, which is a point of great importance. It is readily separated and the work of preparing it is less tedious than applies to the other fiber-yielding plants of this genus. It is well adapted for making rope, twine, sacking, mais, and is highly suitable for the paper trade and immense quantities of it might be gathered and brought into the United States. The bark is son times called Cuban-bast, and at one time was used for tying bundles of the genuine Havana cigars, but after ward imported as a substitute for the Russian bast used by the gardeners for tying up plants. It has also een used in making cigarette wrappers, and it is employed in many regions for making fishing nets.

In Nicersqua and in many other parts of Central America mahagus fiber is very abundant. It is used by the native store-keeper of the interior, instead of twine. The Indians and the native ranchmen use it for making lasses, halters, and ropes and wherever strength and durability are required. The majority to beatmen depend upon it for making their tie-lines and anchor ropes. The only expense incurred is the time required for making the ropes, while imported ropes are too expensive for the average beatman to buy.

The malagua is found also on all the principal islands of the South Sea. In Guan the inhabitants utilize it also for making rope. Nearly every family is provided with rope-making appliances. The ropes are used chiefly for halters and lines for tethering cattle and caraboes, for harnesses and for onlies for

are used chieff or hatters and lines for tethering cattle and caraboes, for harmoses and for cobies for ferrying rafts across streams. The strength and during the control of the care and care

## Heated Steering Wheels

EVERY motorist knows how uncomfortuable his hands are in a biting bilesard, or even on a still, but reve, cold day. To make life more agreeable an inventive genius has patented a bollow steering wheel, into which exhaust gases from the motor are conducted by means of a small pipe running parallel to the steering column. In the case of electrics, the hollow rim is fitled with electric "beatering beatering" in the case of electrics, the hollow rim is fitled with



Sir William Ramsay in his laboratory.

Sir William believes it will be fessible to generate gas directly in mines that can no longer be worked p

## Gas-Power Direct from the Coal Pit. An Interview With Sir William Ramsay

## By Paul F. Mottelay, London

AT the recent Smoke Abatement Exhibi-tion at Agricultural Hall, London, Sir William Ramsay made the first public reference to his projected power scheme. many believe, his views can be effectively carried out, coal miners will find their services are no longer needed, or at least the

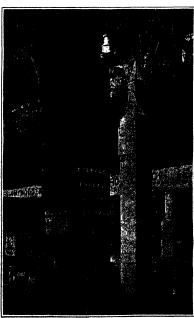
demand for them will be much reduced. Sir William remarked that he had for many years been working with gases of all descriptions, in large and small quantities, and had managed to deal with such a very small portion that it would not fill one half a hollowed needle. There is, he says, nothing so easily managed as a gas. Although it cannot be seen, its presence is always evi-dent it can be made to stream through a pipe at any desired rate and, when received, it can be handled as required.

Knowing that in the mining of salt, water is put down to the rock-salt where it remains until the rock is dissolved, when it is pumped up in the form of brine, he thought that possibly the simplest way to secure at much less cost all present heating facilities would be to cease burning coal altogether. This he proposes to do in a novel manner, which, if thoroughly successful, would enable us to do away, among other things, both with coal mining and with coal smoke. He does not see why our gas retorts should not be in the bowels of the earth, where the coal could be readily converted into gus, in lieu of going through the prevailing difficult work and enormous expense incident to raising the coal to the surface for the purpose of there ob-taining the very same product. The latter could then, of course, he employed in any manner desired, especially in gas engines, which are the most economical of power producers, giving, as they do, an efficiency thirty per cent as against an efficiency of less than fifteen per cent from the average steam engine. Electricity could, even at the pit-head, be generated by the gee engine and conveyed under high tension to very long

Sir William Ramsay has completed arrangements with a prominent colliery pro-prietor which will enable him at an early date to carry out all necessary experiments to prove his contentions. The advantages he claims are:

Electric power for ratiways and industries at one fifth, and possibly one tenth its pres-

"If only one tenth of the amount of coal is used by the means oposed, you would multiply by ten the years of life left to the coal field. All the supplies of coal that are at present worthless could be brought into use. A scam must now be two and a half or three feet wide before it can be worked. In the new crast might be under a foot thick, and a half shale, neither worth min-ing nor worth having even if it were mined. There are plenty ing nor worth having even if it were mined. There are plently of worthless scams where there is no population. There may be of course unforscen difficulties. There are always difficulties, but hope soon to prove the value of the experiment"—Sir William



One of the sublisis at a recent London exhibition men how much power and fuel they waste by telerating their murky, smoky atmosphere.

The consequent electrification of the ratiways and the supply of electric power, instead coul, to factories.

Domestic lighting and heating at a fraction of their present cost

Such a saving of fuel as will prolong the life of the coal fields almost indefinitely

And, a saving of man-for, in place of miners, the workers who will be most needed will be skilled mechanics

recent interview, Sir William said that his intended experiments are likely to cover a period of several months. They will be made with a practically worthless stratum of coal, located as near surface as possible to lessen expense. To reach this stratum a bore-hole will be made, which need be only a foot and a half diameter through which a tube, about six inches in diameter, will be put down to keep it free from water. As this tube descends it will naturally reveal the exact nature of the various strata. "Thus. there will be no expensive shaft to sink, no tunnels to drive, no rubbish to remove In side this tube, you could insert two smaller pipes, one inside the other, the smaller of papers, one made the other, the smaller of the two for the purpose of pumping out the water, and the other for passing down sir, steam or small quantities of water to burn with the coal-there is nothing new in that, The coal, of course, would be easily ignited, in the first instance by passing down an elec-tric wire which would then be withdrawn. Your gas engines would enable you to utilize thirty per cent of the fuel value of the coal In other words von double your yield of energy. Transmission from the pit's mouth through high tension cables need present no difficulties. In California they have sent it two hundred miles, and there is no reason why it should not be sent very much farther. Any coal that is too bad to be worth mining could be utilized in this way, it could mining count be made to burn where it lies. At first, of course, you may find coul owners objecting to setting their coal mines on fire. Also, it may be objected that, as the coal is burned out this ground will sink. So it will, but this already happens in the sult districts. and nobody minds it much, it happens grad ually, and people just accept it The existing coal mines, I should say, would be kept open as a sort of reserve. The change is bound to be gradual. And for steamships, naturally, the electricity from the pits would be useless; they will always need coal or

some other form of fuel."

When asked if the producer-gases to be brought up from the coal strate by the above-named process could be utilized for any other purpose than working gas engines, Sir Will-

iam said: "It is a question of cost. You cannot convey this gas very far owing to the expense of piping. If it could be used at a reasonable distance, perhaps ten miles, it might pay to put down piping. The cheapest thing to do, however, would be to convert the gas into electric power and distribute electric current. By means of the high tension current I spoke of, the cost of electric power would be reduced to about one tenth of a penny a unit, compared with a penny a unit that is now the price for power, and with fourpence a unit that is the price for light. Here then would be the means of electrifying all the railways at once, and of supplying power to all the factories. This would be a start. It is not possible to say at this moment what you pulght not do howlder. As soon as it was shown that power could be purchased at one tenth, or support say only one fifth the cost that it is at the present time, I feel that railway companies, factory owners and others would have no hesitation in using it. Indeed, they would be bound to do so Another enormous advantage of this conversion of coal into gas and elecwould be the saving in fuel. I made a state ment some time ago that in one hundred and seventyfive years, the coal supply of Great Britain will be ex-lamated. Mr McKenna has challenged this statement, remarking that it did not take account of the reserves. These reserves, however, are very questionable, and I replied at the time that supposing they were taken into account it would only give the coal fields a duration of some two hundred and fifty years. in this connection I may add that, instead of the blazing fire on the domestic hearth and in place of the present rather costly system of heating rooms by gas or the existing apparatus for electric fires, the novel and possible alternative of obtaining heat by means of wires through the carnet would be practicable. Get your carpet at a temperature of seventy degrees and your room will be quite comfortable?

A very interesting object less ness of our present methods is afforded by the accompunying libstration The square black pillar, which represents London's annual average soot fall is standing beside a comparative model of the Westminster Clock Tower, and the very small white monument back of the potted plant represents the Cleopatra's Needle on the Thames embankment.

While it would be entirely premature to make any positive statements at the present time either in favor of or against Sir William Ramsay's proposed method of coal mining, the project has in it something exceedingly alluring, and recalls in some respects the work of Frasch, which gave Louisiana a new industry, and well threatened to destroy the sulphur mining industry of Sicily

## Cultivation of the True Cinnamon

THE aromatic spice called chammon is the inner bark of laurus chammonum Linn, a beautiful tree attaining the size and approaching the appearance of our near tree. The small, smooth and shiny branches, young shoots, from the stump alone are available The leaves are exceedingly variable, and in this re-The nearest are exceedingly variable, and in this re-spect realidd one of our native assaciffres, to which the chinamon tree is very closely rolated. To produce the commercial bank the trees are allowed to grow for from five to seven years, when they are felled and the stumps allowed to produce young shoots called coppice. The same methods are followed in the East Indies to grow straight and smooth shoots of chinamon as the basket-willow grower adopts in this country. It is kept coppiced in order to induce the formation of long willows shoots A distance of three feet between each stool is allowed in setting out young cinnamon trees of time square feet being required for each stool to produce the greatest number of desirable shoots. The chinamon plantation may be regarded as a young forest with a short rotation period and not as a garden, which is regularly cultivated. The chinamon plan-tation continues to yield abundantly crop after crop for many years. A good many of the plantations in Ceylon that are now regularly yielding chmamon were started by the Dutch a hundred years ago and are quite ly to yield crops for a hundred years to come.

The chinamon is cultivated in about every part of ite East Indies, but it flourishes most profitably and is found most pientitully in Ceylon in the silicious soil round most petition) in Cyrion in the sincious soil with an admixture of vezetable mold. It is said to be a native also of the Mahbar Const, and has been introduced into Javo, Reunion, the Cape Verde Islands, Brazil, the West Indies and Uganda in East Africa Ceylon it produces the sweet taste, aromatic smell, and the pule brown or russel color, which renders the bark so valuable as an article of commerce and useful as a spice. Cinnamon bark from plants, even of the genuine spice Chanamon bark from plants, even of the genuine kind, when grown in low marrby ground, subject to inundations, loses its characteristic properties. The chanamon plant requires a certain amount of soil moisture for the full development of the spice, but stagmant water injures its flavor. The whole of the Coylorefones its sandy and moist, and is generally favor-

able for the growth of cinnamon, which flourishes best in a hot and damp climate such as is there found. When the young climamon shoots are ready to be out off, the Cinglaise shorers, called Chalisa, provide them-selves with sharp light bill-hooks and stout cord with which to tie up the sticks. By the middle of each day the cutters have sufficient shoots to occupy themselves in the barking process the remainder of the day. The bark is then slit open longitudinally on opposite sides with a curved sharp-pointed knife; on being carefully stripped off, it is laid saide to dry for about two days when the epidermis is scraped off with a broad blunt knife about two and a half inches long. After the cuticle is removed the bark is assorted into three quality classes, according to thickness of bark and brightness of color; the short pieces of each kind are set aside, to be piaced in the interior of the pipe, while the longer ones are placed outside. The piping or quilling then commences, the peeler so selecting the bark that very little cutting at the ends is required to form them into proper lengths. The quills are made into uniform lengths of three feet and a half, and three layers of the bark or quill, inside each other. Much of the value of the spice depends upon the proper grading in quality classe

It is generally calculated that ten fairly proc It is generally calculated that ten rainry products stumps yield one pound of thoroughly dried bark, and that the shoots growing up from the stumps mature every two or three years. After the first crop of shoots is harvested a fresh supply of young shoots appears which grows very rainful as soon as the we shauon starts in. Those shoots which are considered fit for continuous matures in the shauon starts in. Those shoots which are considered fit for continuous many those shoots which are considered fit for cutting are usually three fourths of an inch in diameter and from five to six feet or more long.

It is well known that the bark yields an essential oil, and from the leaves an oil is obtained which resembles clove oil, and is known in commerce under the name of "oil of cloves." From the root of old trees is extracted an excellent camphor, and the flowers are also used as a spice. The pulp of the berries is times made into cakes.

Imports of Cinnamon, and Chips of, Unground, Entered for Consumption in the United States During Years Ended June 30th, 1900 to 1911.

Years Ended June 30		Quantity. Pounds		Value.
1900		418,374		\$59,544
1901		483,992		77,685
1902		358,832		55,512
1903		641,214		92,646
1904		675,873		80,502
1905		621,948		78,425
1906		645,758		78,473
1907		777,507		106,827
1908		520,460		76,634
1900		1,022,846		93,856
1910		921,042		87,798
1911		1,147,428		100,640

## How Nature Punishes the Parasite

NATURALIST, observing the difficulty a but-ANATURALIST, observing the difficulty a but-leverly has in breaking from its chrysalis, de-termined in the kindness of his heart—they are not all calloused, those men of science—gently to cut away certain impediments, so that it could the more easily free itself. The result? Instead of emerging strong and large and beautiful, it was a frail thing indeed, without strength in its body or beauty in its wings; the very struggie of which the scientist's mistaken kindness had relieved it, had contained and conditioned the source of its beauty and virility. Again: Ducklings helped from their shells differ from these which have to fight their way out, in being stunte weaklings—if they are not still-born, or die soon after the too-solicitous hand has helped them out of the

biell-stage of their development.

Biology divulges many forms of life which will not take the trouble to find their own food, but prefer to borrow or steal it from the more industrious; this is oftentimes an acquired habit, and a most grievous, had one, for which nature invariably exacts a dreadful penaky. The dodder begins life with excellent inten-tions, strikes its root deep in the soil, means evidently to be really independent. But after a brief period of dignified self-support, it comes to fix sucking disks into the stems and branches of adjacent plants, until finally it does nothing at all for its self-support, and instead draws all its supplies ready made from the sap (the life-blood) of its host. Having thus become a parasite, irre-noon) or its nost. Having thus necome a parasite, needing no organs of nutrition of its own, nature takes them away; and thus the adult dodder presents the miserable, degraded spectacle of a plant without a root, a twig or a leaf, and with a stem so frail as inndequately to bear its weight. In the mistletoe the parasitic habit has been hereditary through so many parasite meant one own necessary turougn so many tenerations that the young forms begin at once an ignoble and dependent existence; the berries, which contain the seeds of the future plants, are developed to minister especially to this degeneration; for they and apple trees.

and apple reco.

The ordinary crab should spelle was
tion; and be has a "bustasse end" to life
mands respect. He leads a rough said
jagged rocks are his heliast; and assess
dashed about by overy wave, while on a dashed about by every wars, while on every julis has planten enemies stated, him. As a distance against synthem environment he has developed, by the juli day simple themselves), a strong and servicesible ones of years them was, yould being themselves), a strong and servicesible ones of the same like instantial that the port and needy relations, while hermelt crab. The latter's propentions long ago lab's as the distribution of the latter's propentions long ago lab's as the distribution of the latter's propentions long ago lab's as the distribution of the latter's propentions long ago lab's as the latter's propentions long ago lab's as the latter's propentions long ago lab's as the latter's propention of the latter built habitations that had ones avecause at your molitance. The result of this house-free, purioding policy is that generation after generation this kind of creek dwelling in its appropriated abell, has consect to bother or concern Mealf about questions of matery Wherefore Nature (as stern as she is just) has written this six against evolution, this semi-parasition, more ed to plainly upon the hermit's organisation, for the reading of all, to its shame. This apology for a crab has suf of all, to its shame. This apology for a crab has sur-fered in its anatomy precisely in proportion as it has borrowed or fliched from its earlrooment; it is sow no more a tixty, perfect, commandable crab! its body has sadly deteriorated; several vital organis are par-tially or wholly atteptibed; its aphere of life has be-come deplorably limited. Having by a cheep and unworthy expedient secured safety, it has in consequence fatally compromised its independence. Not now needing to construct its own coat of mail, a vital induce-ment to a life of dignified and vigilant exercise of its own powers is correspondingly withdrawn. A number of functions have struck work; consequently the whole organization has become enfeebled. By the stern law of evolution—that an unused organ must atrophythe hermit has not only lost all power in certain parts. but also those parts themselves. Instead of the thick, chitinous shell of the self-respecting crab, the hermit can show only a thin and delicate membrane: this laif-naked and woe-begone hobo of the seas presents certain of its limbs as rudimentary, or so small and wasted as to be but pitiful apologies for limbs. The only compensation for all this deceneracy is that such additional tail development as will permit it to hold on to its extemporised retreat, has been required.

Almost every animal is a living poor-house, harbor ing countless lazzaroni, supplying them gratis, not only with a permanent home, but with all the nece and indeed also all the juxuries of life. The animal is thus an unwilling host, to its own prodigious discomfort. It is a questionable philosophy of David Harum's, that 'a moderate amount of fless is good for a dog, it keeps him from broodin' on bein' a dog." The fies gets too much the better of the bargain.

Nature abounds in such examples as these of para-sitism and semi-parasitism. And deductions are ob-vious: Effort is quite as essential for human well-being as for that of any animal. In the universal scheme the genus home is conditioned as to his life processes, precisely as is every other creature in the cosmos. Man is perversely foolish to imagine the universe to be anthropocentric, and that he can afford to flaunt the "eternal verities." In the hands of Nature he is as helple s as any other sentient thing. Her laws of heredity, of environment, and of function govern him as inexorably as they do the dodder and the hermit crab. While vitiating their own stamina, the indolent and the selfish inflict a most grievous phieboindozen and the seina innice a most grisvous pineo-tomy upon the virile and the seif-respecting portions of the race. The charity which helps the individual to help himself is altogether laudable. But indiscrim-inate charity is a cruel wrong, both to the recipient and to his community. And is not this true also of paternalism? When will the body politic come to appreciate that what its government bestows upon one portion of its citizens must inevitably—there can be be abstracted (in the form of taxes) from the remainder of the people?

## Experiments With an Aeroplane Gun

SOME interesting experiments were made at the Brasschaet military aeronautic grounds in Beigium with a mitrailleuse mounted on an aeroplane. The mitrailleuse is said to be of American invention, and is designed specially for this purpose. The object is to defend the aeroplane against stracks from the and, and especially against other seroplanes of air-ps. The gun is air-cooled and is of very light build, and it can fire as many as 500 shots per minute, each ball having 5,000 feet per second initial speed. It was a real problem as to how to mount the gain upon the a year problem as to how to mount the gun upon the acroplane in the proper way, but this is now mechan-fally done. A special suspension device allows the gun to be sized in all directions, and means are provided so that the ejected points will not contage the halfset. Other dwilders serve for the significant for completeness, but for this sixth of the world and far. toe for the notion of the wind and the item.

## Correspondence

Etha selliers are not responsible for statements in the correspondence polumn. Anonymous comne comet be considered, but the names of ate soll be withheld when so desired.]

## A Card Trick

To the Editor of the Scarrerric American: Under the above beeding on page 55 of your issue of July 20th is given a card trick called the "Hawalian of July 20th is given a card trick called the "Hawaiian highing," which depends upon the fact that outning a pinds of cards never alters the relative position of the pends provided that if necessary you regard, the top pend as fallowing immediately after the bottom card in the peak. The following trick depends upon the same fact. Deal the cards of a peok face upward on the table, calling them 1, 2, 3, etc., as you put them down, and mentally noting the card first death. Ask some one to select a card which is being iaid down, and resolute its number. Turn the peak over and let it song one to seem a card wanch is being and cown, and recollect its number. Turn the pack over and let it be cet as often as the person lites. Ask the number of the eard chosen. Then deal the cards one by one, and when you come to the original first eard, ount it silently as 1, and the selected eard will appear at the number mentioned. If all the eards are dealt before machine this number turn the cards over and to one reaching this number, turn the cards over and go on sounting.

H. S. Arnolp. ounting. New York.

### Drain Pipes and Mosquitoes

To the Editor of the Scientific America;:
The section in which I lived last year is practically
immune from mosquitoes. Last summer, however, we
were troubled considerably. The country is hilly and well drained. There are no swamps or other bro

One evening just before dusk, while lying in a ham mock, I noticed a swarm of mosquitoes around the coping most, I nonced a warm of meaquiness around needping of the house. I got a ladder and son discovered the source of the meaquitoes. The gutter along the coping had sagged and the last rain had left considerable water in it, which was quite stagmant and full of wriggiers.

Te repaired the gutter and the mosquitoes disappeared. It has occurred to me that you might like to have this

Philadelphia, Pa.

The SCIENTIFIC AMERICAN has from time to time called attention to gutters and drains as breeding places for mosquitoes. So, too, the United States Department of Agriculture has issued popularly worded bulletins in which this information is conveyed. Although our correspondent has discovered a well-known fact for himself, it seems to us worth while to publish his communication since it may serve to assist others in ridding them-selves of our summer insect pests.—Editor.

## The Aviettes

To the Editor of the SCIENTIFIC AMERICAN:

With reference to article on page 9, SCIENTIFIC AMERICAN of July 6th on the failure of the Aviettes, is it not a fact that bicycles being dependent for their driving effect on the friction between the road surface and their wheels like all other self-driven vehicles cannot be raised weeks like all other seal-crived reniese cannot be raised. from the ground by any means except an acrial propellor, assuming it to be possible to fit such a propellor. As the planes tend to raise the bloycle and so reduce friction at the wheals, the bloycle would, it appears, necessarily stop immediately it began to feel the liftup effect prod by them.

uld interest me and several other people very much to hear your views on this matter.

Achnahaird, Uliapool, Ross, N. B. D. A. Lawson.

[Our correspondent is right, if his supposed aviette runs constantly at an effective lifting angle, but if kept at rans constantly at an enserver arting angle, out a very sero life, it would permit the wheel to have full grip on the ground until its full speed was acquired, whereupon the plane could be uptilted and suddenly have its maximum lift.—Eprron.]

## Wanted: A Small Gasoline Plow

To the Editor of the Scientisto American: It seems to me that inventors are slow in getting The Real Machine devised for the small farmer to supplant the two horses to do th horses to do the work in pulling the various plows concessedly and efficiently than two horses can do

I samnot delve deep in the matter of gasoline propelled shicks, but possibly some suggestions I have to make a manner curve comp at one suggestions I have to make vehicles, but possibly some suggestions I have to make would be of some value to a would-be inventor. A ma-chine of fible kind should be as compact as possible in order to make a turn in a given radius at least that of a mule. It should have rather high, wide-tired Principle with heavy goaring. The motor plant should be a tisocated that it will rest on spring coshloss attached a trame, instead of heins rigid to frame, thus obviating

sssity of eushion tires. Now if it is mechanically consider to couple the power plant to a differential ear, resting on a spring in the above manner, I cannot see why such a machine could not be made practical for aforesaid purposes. Would be glad to read some ment on this.

E. M. BLACKSHER

## Fastening Dress Shields Simply

To the Editor of the Scientific American

issue of the Scientific American of June 29th, under "Notes for Inventors," request is made for some simple method of fastening dress shields to dresses. For a simple and effective method hooks and eyes will answer the purpose. Sew a hook at each end of shield and one at extreme edge of side of shield that rosts against side of dress (at points where sowing or pinning would ordinarily be done). Attach to dress an eye to correspond to each hook. If small hooks and eyes are used they will be almost invisible. By fastening eyes to each dress the shields may be readily removed from one dress and placed in another. Brooklyn, N. Y. J. A.

J. A. G. HARTON.

#### The Rail Question

To the Editor of the SCIENTIFIC AMERICAN:

I presume you have seen in the daily papers that the 18-hour train of the Pennsylvania Railroad, which met with an accident on a straight track, going about 60 miles an hour, was not running faster than her usual rate of speed because she was on time. This may bring about a reduction in the running time of the 18-hour trains of both of the roads and I hope it will set the people to thinking that cold weather is not the only

There not seen as yet an official statement which gives the cause of the accident, nor will I draw any conclusion as to the probable cause. Attached to this letter you will find a list of accidents which happened to our fast trains during the month of December, 1911, and the months of January, February, and March, 1912, with the causes and the number killed and murod. I got the causes and the number killed and number. I get my facts from the daily newspapers, those of good character only, the New York Evening Post being one, and correct these facts by the monthly statement of socidents issued by the Railway Ape-Garette. Mr. S. O. Dunn, as you know, is a careful some 8. O. Dunn, as you know, is a careful man; the reports that are printed in his paper I believe are true and unbiased. This list that I have sent you is a copy from my book and if you take the time to examine you will see that broken rails were not by a good deal the causes of all the wrecks or even some of the worst

My firm belief is that the rail question needs atten more than this ery for reduction of speeds. rail that is frozen will break, I believe, as well under a freight train as an 18-hour limited. It is known that our high carbon steel rails do first rate service on a freight road, such as the Buffalo, Rochester & Pittsburgh, but that on trunk lines where we have freight and high-speed passenger trains they are apt to got brittle with disastrous results. Not many people are aware of the fact that on a certain trunk road in the aware or the sact that on a crime was not properly Middle West, because an engine was not properly balanced, 150 broken rails were removed the next morning on one side of the track after that engine with its fast train had passed over it in her run; or that on another trunk line a little farther north in a 100-mile stretch 200-odd broken rails were removed after a night's traffic had passed over it. These facts may illustrate how important the rail question is, not so much the speed question, though I think the State of Michigan was right when it prohibited the railroads in that State to run their trains faster than forty miles our during the winter and part of the spring months

The next question in the speed reduction of our fast trains is, are our trains really fast? I have added to trains is, are our trains really last? I have added to this list a list of fast trains which I have copied from Radiusy and Locomotive Engineering. While I will not youch for its correctness, I have no doubt that Mr. Sinclair's paper which is first-class in every respect, will.

If you look at the list you will find that fast American trains do not figure as prominently as they ought to The European roads do not have as heavy trains as we do, nor is their equipment as strong as ours. But from all I hear I believe their tracks and roadbed are better than ours in a good many ways Take, for instance the London & North-Western, and the use of its stee bell zamon or view vesters, and the use it is seen belairs, two on each tie. Not many roads in this country use it, and I don't know of any unless it is possibly the Pennsylvania. None of the European roads to any great event him is teel equipment, and only one in this greats extens has steel equipment, and only one m can country has propressed to any great extent. I refer to the Penniylvania, and to it should be given the credit of its infooduction. As a matter of fact, that road is way shased of the others anyhow. The Interested Commerce Commission was quite right when it took up last year the matter of safety

devices and ordered that certain of these devices be used on the equipment, and let us hope that that same body will order the railroads soon to order steel equipment for its passengers. If the railroads will not voluntarily stop the killing of the passengers, then legislation must. The railroads are not all to blame. That same mentioned above makes mistakes, but who has not? Labor organizations do not help in the reduction not? Labor organizations on not neith a me excession of accidents as they might and as they ought. In fact, I believe they help thom. If I may quote James O Fagan, in his "Confessions of a Signalman." he says that a division superintendent says, "Within a week we that a division superintendent says, "Within a week we could put a stop to these accidents." I believe Mr Fagan is right. This accident question must and ought to be investigated properly, and the sooner the better for the public.

CHARLES E FISHER.

Taunton, Mass

ACCIDENTS TO FAST TRAINS IN UNITED STATES DURING DECEMBER, 1911, AND JANUARY, FEDRUARY AND MARCE,

Tauton, Mass

Accinery to Part Taulie in United States Drains
December 18th, on the Class. Mirestoce and St. Paul at the Committed Commi

March 4th, on the Pennsylvania Lines, the "Pennsylvania pecial" (18-hour train) was derailed near Bucyrus, Ohlo No ne was injured. Caused by the breaking of the wheel on the

of the second engin tender of the second engine
March 7th, on the L S & M S (New York Central Lines),
the "Twenfieth Century Limited" was decalled near Cloveland
One was killed and nineteen injured. Caused by a wheel break-

ing on a sleeper

March 7th on the C. C. & St. L. (New York Central Lines),
the "New York Central Limited" was detailed near Beliefontaine, Two were hurt Some one allowed a box car to block um Valley Street Crossing and the train was detailed.

the Pinn Valley Street Crossing and the train was desiled, cutting the box can in two March 13th on the New York Central & Hudson River, the "Twentisht Central, Limited," was devalled near Poughkeepde, N. Y. Theent-three were injured. Caused by a broken rail March 13th on the C. C. G. & M. L. New York Central Lines, the "New York Central Centra

In the above list the numbers reported killed and injured include employees and passengers. Persons killed and those who are seriously enough injured to within 24 hours after the accident are killed. Persons injured to require medical attention are reported injured.

## Fastest Long distance Trains

Railway	From	То	Miles		per hour	
Northern (France)	Paris	Calais	185	1	59	72
Prussian	Beelin	Hamburg	177	69	52	51
London & North-West	London	Edinburgh	393	5	50	77
N.YC & LS & MS	New York	Chicago	082	49	50	66
Caledonian	London	Edinburgh	401	5	50	18
P. L. & M. (France)	Paris	Mentone	687	5	49	10
Pennsylvania	New York	Chicago	897	U	47	21
Orienza (France)	Paris	Bayonne	488	0	49	3
NY.C & HR	New York	Buffalo	440	0	49	3
O. & S (France)	Paris	Madrid	903	0	38	49
Various	Ostend	Vicaus	822	0	37	85

Copied from the June, 1912, Railway and Locomotice Engineering.



THE maneuvers of the sanitary de-THE minerivers of the sanitary def-partment of the milliary government of Parls, which take place animally at the furivelle cunin, were unusually interesting this year. The exercises included the establishment of a res-cue service by automobile, a relay ani-bulance service and a temporary hospital, in addition to curious experiments in training dogs to search for wounded men. The most striking characteristic of thems The most striking characteristic of these maneuvers was the extensive employment of automobiles for the expeditions res of the wounded.

The most remarkable specimen of the new equipment is an automobile operat-ing room, in which surgical operations can be performed at the battle-front in conditions as favorable as those afforded by a hospital. Severe abdominal wounds by a nosqual. Severe andominal wounds, which are very common in modern war-fare, cannot be operated upon properly by the ordinary field service, and in many cases the removal of the patient is equivalent to a sentence of death

The new vehicle, which has a 40 horsepower motor capable of developing an average speed of 20 miles per hour, is furnished with all of the accessories and the latest improvements of a hospital operating room. Its principal compartment, the operating room proper, con-tains an improved operating table and a basin supplied with sterilized water. In front is a smaller compart-ment, containing the sterilizing apparatus and the electrical apparatus, which is op-erated by the motor, whether the vehicle is in motion or at rest

A very ingenious arrangement enables the surgeon to locate the bullet accur-



The operating room of the motor hospital contains operating table, trepanning apparatus and sterilizing basin.

ately by the application of Roentgen rays The operator, shielded from diffuse light by a photograper's hood, moves the fluorescent screen over the patient's body un-til the shadow of the bullet falls on a til the shadow of the bullet falls on a small hole at the center of the screen. By inserting a pencil in this hole the position of the shadow is marked on a sheet of transducent paper, ruled in squares, which is placed under the acreen. The angle of observation is then altered slightly and the new position of the pro-jection of the bullet is marked in the same way on the ruled paper. From the distance bulkwen, the two marks the distance between the two marks, the depth of the bullet can be obtained, by re-

ferring to a table computed in advance.

The operating room also contains a complete trepanning apparatus, which is

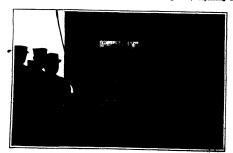
operated by a special motor.

The vehicle carries an apparatus for sterilizing water by ultra-violet rays, for the use of the troops. The water is drawn from any convenient brook or pond

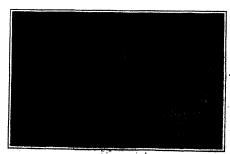
drawn from any convenient brook or pond by an electric pump.

A folding tent, for the shelter of patients before and after operation, is at-tached to each adde of the vehicle.

The employment of automobile opera-ing rooms of this sort would save many lives. In the recent war in Manchuria the mortality among the severely wounded was 90 per cent, because of the inadequate facilities for prompt operatory treatment. This mortality could prob-ably be diminished by two thirds by the of automobile operating rooms which operations could be performed in perfectly aseptic conditions, without loss of time, before the removal of the patient from the field.



Showing the method of suspending stretchers in a military hospital vehicle, and the positions of the patients.



motor hospital, besides its operating and sterilizing equipit, carries a shelter test on each side, ready for pitching

## The James Gordon Bennett Aviation Contest of 1912

The international acropiane speed contest of this year, I though a failure in one respect, was a glorious success in assertier. No American encopiane was available to defead the Hennett Aviation Cup, and no nation except France attempted to take it from us. Thus the race proved to be a friendly rively between French monoplanes. They were two lesperduceds matchines, if 140 and 160 horse-power and a Hanzict of 160 horse-power, piloted, respectively, by Jules Vedrines, Maurice Frevost, and Andrés Frey, all highly trained aviators who did their most skillful firjing around the fine 4.16 mile course. In exact figures the whole distance to be covered was 124.8 miles in thirty laps around an elongated rectangular course terminated by beargonal ends. Though the meet was a failure for lack of representation it was a spiendid triumph of scientific design and construction, of manipulative skill and of that highly honorable sportsmanship which impels a man to dedicate his fortune, with scant promise of financial return, to the development of a noble art and the renown of his fatheriand. Becherosu, the scientific designs of the winding machine; learning the development of a noble art and the renown of his fatheriand. Becherosu, the scientific designs of the winding machine; learning the development of the unified machine, it all are to be felicitated, not only as conquerors for France, but for humanity as well. And to this list must be added the name of Seguin brothers, whose wonderful finome curies for the security of the name of Seguin brothers, whose wonderful finome curies as a security of the se

How Vedrines Won

gase is vital part to those marvesons racers. As a mere spectracle the contest was worth journeying a thousand miles to see. The day was cloudless and hot, but relieved by a fair breeze. Owing to the heat on the vast mesdowland, and the numerous trees in the interior of the circuit, the air was filled with eddless enough to keep the racing pilots

enough to keep the racing pilots constantly after and afford pulpable evidence of their skill. There was frequent toolsing and rocking of the screplanes, too often requiring a liberal margin in rounding the pylons, but these effects second instantaneous; for a mechine moving 150 feet per second has little time to be disturbed in crossing the aver-

administration in a matchine moral 199 feet per second has little time to be disturbed in crossing the average hump or airhole. Usually the flight seemed like that of a projectile, or, as was aptly said, like that of a winged cannon moving breech foremost swiftly along its level course through the air. The turns through

69 degrees at each pylon were made with narvelous suddenness. The fiver would shoot like an arrow straight for the turning point, bank suddenly round the pylon, recover its level instantly, without rocking, then shoot in revilineer flight again, but a few yurds above the earth. When a lumbering biplane plodded overhead, it seemed to stand still as the real racers shot beneath, gaining on it more than sixty miles an hour.

As no accident impeded Vedrines in his official flight, he was easily the winner as anticipated. Prevost came second, as expected, and Frey third. But Frey stopped on the 24th round because of motor trouble. The official recyrd gives Vedrines' average speed for the entire course as 105.5 miles an hour, Frey's over 28 lays, or 94.8 miles, as 19 miles as 19 miles as hour, Vedrines' as 250.05 miles an hour, Frey's over 28 lays, or 94.8 miles, as 19 miles as hour. Vedrines fell a tride short of his previous recept of 106 miles per hour, while Previous merced of 106 miles per hour, while Previous that the contract make the contract of the previous freezed of 106 miles per hour. At the end of 15 miles per hour. At the end of 15, miles per hour. At the end of 15, miles in 6 minutes 15,05 secuels, making a new worlds speed of 15, miles in 6 minutes 15,05 secuels, making a new worlds speed of 15 miles per hour. The official time for each lap shows that the 3 miles of the period for 20 kilometer. The official time for each lap shows that the 3 miles of preser with previous mental proven with great regulation of the previous mental previous me

rudder hinged to a fixed vane. The machine over all measures 21 feet fore and aft, by 191/2

By Our Staff Correspondent

over all measures 21 feet fore and aft, by 19½, feet from the to they of its wings, whose average width is about 5 feet. It weights 710 pounds empt), and in the official race carried 117 pounds of gasolene, 0½ gailons of costor oil, making its total weight without plot about 880 pounds. The wings are completed about 880 pounds. The wings are completed about 8% inch, which makes them seem flat below; but they are quite convex above, being thickest near their forward edge, where the front startly covered above and below, and are warped to govern the lateral poise. In addition to the usual four stay wires under each wing there is a fifth running from the outer forward edge obliquely inward and rearward to attachment at the chasels. The controls are the especial delight of Vedrines; for he says he can maintain his fiyer in perfect poise with the thumb and fore-finger of his left hand white saluting with his right hand, and, in fact, throughout the course. The warping is effected by rotating a pilot wheel in the direction the machine is to be fitted; (the horizontai rudder is operated by push-

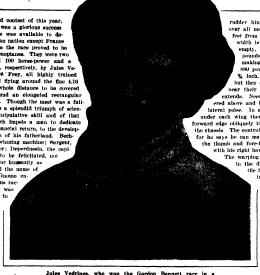
ing the wheel fore and aff, thus moving the rocker arm on which it is
mounted. To this rocker arm are
attached the push rods which operate the horizontal rudder at the
rear. Each warping wire, jaesing
from the hub of the pilot wheel,
thence along the rocker arm supporting it, runs down through the
fuselage to the horizontal arm of a
hell-crank lever pixtuded on the
lower part of the chassis. The
other arm of the lever portundes
vertically downward some linches
and at its lower end unites with
the warping wire of the corresponding wing. When the wheel is ro-

tated it accordingly turns those two holl-crank levers in opposite directions, thus causing the wings to warp oppositely. The sterring radder is worked by the feet actualing a horizontal rocker arm just above the floor of the clauses, the ends of the rocker arm beling attached to the rudder wires. Thus the pilot seated on a custion on the floor of the fusel-

a cushion on the floor of the fuselage, his head Just protruding above its ceiling, and the lonse of his skuil resting against a special cushion, seems the picture of confort, and the more so because of the wind shield just before the cock-pit. The flab-shaped fuselage is of

nearly circular cross-section at its front, near the revolving motor, but rearward it is of oval section From the side it much resembles a headless fish with rather straight back and more curved ventral part It was constructed of long poplar boards 5 inches wide by 1/2 inch thick, bent in layers spirally round a solid form, the grain of one layer running obliquely to the grain of its neighboring layer. When the whole is dried the form is with-drawn and a hole is cut for a cockpit in the remaining shell. At the front of the shell, or fuselage, is placed the 14-cylinder revolving Gnome engine, surrounded with its oil shield. At the front of the motor is attached the screw propeller of 2.35 meters diameter meters pitch, bearing a coaxial convex circular wind shield which at lows the air to rush directly against only the outer part of the revolving cylinders. Thus, the engine meets ss resistance, and is more cooled than if the shield were omitted. Below the fuselage protrudes the frame of the chassis, and is united by clastic bands to the axle of the running gear The two wheels are smoothly covered with sheet ain

(Concluded on page \$51)



Jules Vedrines, who won the Gordon Bennett race in a one hundred and forty horse-power Deperdussin monoplane.

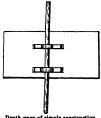
monoplane driven to victory by Vedrines is a marvel of compactness, strength and efficiency of form. It has a fish-shaped hody or fuselsage with a tractor screw in front, a cock-pit just back of the wines, and in the rear a movable horizontal rudder hinged to a fixed concave one for lifting, as also a movable vertical



Vedrines rounding a pylon in the Gordon Bennett race. His average speed was 1955 miles an hour for the course of 124.5 miles.

## Simple Depth Gage By J. A. Brearley

I N the Scientific American of February 4th, 1912, there is a cut of a depth gage designed by Mr Clark. Herewith is a sketch of one which the writer has us for several years, and which is perhaps more simple and more quickly made than the one presented by him.



Depth gage of simple constructi

The rod is made of a piece of %-inch drill rod, and the body of a thin piece of sheet steel. The straps through which the rod passes are made by cutting slits sheet forming the body of the gage, and for the rest the sketch is self explanatory.

The one in the writer's tool box was made in less than ten minutes of scraps such as may be found in

#### A Spider Center

OFTEN a machinist has an awkward-shaped piece to face off in the lathe. The chuck will not grasp it, and the openings at the end are much too large for bull centers. A spider center will then be found useful. Such a center may be made by taking a round boss of cast from about 11/2 inch thick and 3 inc diameter or larger, drilling four holes in the periphery, spaced off evenly, and after tapping out, putting in



A spider center for lathe work

The loss has a countersunk center four set-screws, for receiving the lathe center when in use. The illustration shows the spider center in position. Larger states should be grooved out annularly on one face, giv-ing room enough to reverse the set-screws, so that the points will project outward from the spider, which will allow more leeway for different size

## A Camera Support for Automobile By Frederick E. Ward

H ARDLY anybody nowadays would think of going on an extended automobile four without taking along a camera; but unfortunately the souvents value of the pictures obtained is greatly lessened by the many unfavorable conditions under which the exposures have to be made. Chief among these is the lack of a

have to be made. Criter among these is the mes, or a suitable support for the camera.

In Fig. 1 is shown a bracket attached to the back of an automobile seat, in such position as to hold the cumern with the lens in about the same position as



Fig. 1.—Bracket for supporting the camera on the automobile.

would be occupied by the eye of a person in the seat. This not only serves as a support to hold the camera when it is desired to make exposures, but it gives the novel effect shown in Figs. 2 and 8, where parts of the automobile are included in the foreground. This makes the pictures appear more nearly as if viewed from the machine, and greatly enhances their value as souvenirs.

machine, and greatly enhances their value as souvenirs. The bracket may be bent up from a piece of % inch by I inche cold-rolled seed, and by rounding off the sharp corners and giving it a coat of ename), it may be made to match the trimmings of the car, to which it may be attached as a permanent fitting. When meeded, the camera attaches to it in a moment, by means of the usual tripod thumbscrew, through a % inch hole left for the pury

## How to Hold Heavy Work to be Sawed By William Grötzinger

AGOOD way to hold large heavy work that is to he sawed is shown in the sketch. The work is passed through the triangular opening in a wooden frame, nearly in the form of the letter A. When the frame and work lie at an obtuse angle, they consti-tute a three-legged stool. The upper edges of the board become wedged fast in the sides of the triangle, and the lower side of the board rests upon a cross piece,

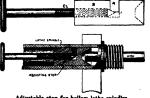


Device for holding boards to be say

which can be placed at various heights, according to the size of work that is to be held. In sawing, the man rests his knee on the work, near the top of the frame, and the board is changed end for end, when sawn through half its length.

## A Stop for Lathe Spindles

Wilfen cutting of a large number of small shafts, much time is consumed in measuring the work at each cut. To save this time, the stop illustrated at each cut. To save this time, the stop litustrated herewith was constructed. Not only did the device serve as a stop, but it assisted in holding the work concentric with the hollow latthe spindle. A small block A served to lock the stop B in the spindle at any desired position. When the stop had been ad-



Adjustable stop for hollow lathe spi

justed to the desired location in the hollow spindle, the screw (' was turned, causing the cone end of the serew to bear against the block A and jam it against series to hear against the holes A and Jam it against the interior of the hollow spindle. After the stop had been locked in this way, the work was placed in the spindle and run back until it seated itself against the conical recess in the end of the stop, as shown in the

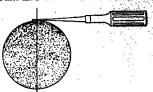


Fig. 2.—The old Cape Cod windmill, West Falmouth, Mass.

## How to Grind a A By H. D. Chi

Service in the service of the servic

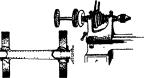
FUTHERE are but few screw-drivers ground;
A The usual taper and of a surjective comand the head of the screw away and will in
a screw that is hard to turn. The accompanys



we the right way to grind the e ad of the blad Place the end of the screw-driver a little beyond the center. The screw-driver ground in this way will seat itself in the screw and grip the bottom of the slot. The blade ground in this way will have little ten-to twist out when it is turned.

## Emery Wheels for Small Lather

An emery wheel may be attached to a watchmaker's lathe or to any hollow spindle lathe as follows:
Use a hollow arbor with threads on each end. By a thin nut the wheels are held in place; the whole thing then is placed on the outer end of lathe spindle. By making a good fit the friction will carry the wheel. In use, a person does not have to make a change either on his lathe or otherwise, as it is within very handy reach for sharpening tools and drills. The drawing shows an enlarged view in section of the construction, view of the lathe head with e



Emery wheels for small lath

d. It does not interfere in the least with work ing the handwheel or using the wire chucks in the lathe, and need very seldom be removed, although this may quite easily be done. It is better to use two wheels, one adapted for cutting down and the other much finer for producing a keen sharp edge.

#### Instrument for Drawing Parallel Lines By H. Bickerstaff

I N the SCIENTIFIC AMERICAN of August 5th, 1911, and again in the Issue June 22d, 1912, there appeared suggestions for drawing parallel lines. Here is another idea that I think even better. Insert a black lead in both legs of a compass and by running one leg against



mpass arranged for drawing parallel l

the T-square the parallel lines are drawn to any width required. This method is useful for other work besides awing lines for lettering.



er of an

## Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

#### Local Notes

Abandonment of Trade-mark.—In the case of Lavaring Coffee Company v. Merchants Coffee Company v. Merchants Coffee Company v. Merchants District of Columbia holds that the right in a trade-mark is a property right and that intent to abandon must clearly appear from the freets and of courses and of course to account of the freets and of courses are consumed to the freets and of courses are consumed to the consumer of the freets and of courses are consumer of the consumer of t the rects and orrours tances surrounding its non-use and that as in other cases intent may be inferred when the facts are shown adequate to support such a finding, but that acts which, unexplained, would warrant an inference of abandonment may be met by a showing of lack of abandonment.

Beer and Near-beer.-In the case of the Independent Breweries Company, the Court of Appeals of the District of Colum-ies afterns the decision of the Commissioner and holds that a beverage composed of malt and containing less than one half of one and containing less than one half of one per cent of alcohol constitutes goods of the per cens or acconditionatization goods of the same descriptive properties as beer; also that the mark "Amber Bead" is properly refused registration in view of the prior registration of "Amber" as a trade-mark for goods of the same descriptive proper-

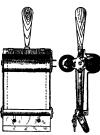
Patents Adjudicated.—In the case of Braper Company v. Stafford Company 196 Fed. Rep., 501, the Draper patent, No. 527,014, for improvement in looms was held not infringed, while in the case of Parke Davis & Co. v. H. K. Mulford & Co., 196 Fed. Rep., 496, the Takamine patent, 730,176, for a glandular extractive techniques (adrenalin," claims 1, 1 9, 12 and 14 were held valid and infringed while claims 6, 13 and 15 were not passed upon; and between the same parties, Takamine patent, No. 753,177, for glandular extractive compound was held valid and infringed as to claims 5 and 6, and claims 1 and 2 were not passed upon.

Amended Copyright Law.—By Act of Congress approved August 24th, 1912, the Copyright Law is supplemented with reset to moving pictures. The amend-ent specifically includes in the act the asses of "Motion-picture photoplays" d "Motion-pictures other than photolays" and requires the deposit with claim of convright of a title and description, with or copyright or a title and description, with one print taken from each scene or act if the work be a motion-picture photoplay; or of a title and description, with not less than two prints taken from different sections of a complete motion-picture, if the work be a motion picture other than a photo The amended act also provides that in the case of the infringement of an un-dramatized or non-dramatic work by mean of motion-pictures, where the infringer shall or monon-pictures, where the intringer sinking show that he was not aware that he was infringing, and that such infringement could not have been reasonably foreseen. could not have been reasonably foreseen, such damages shall not exceed the sum of one hundred dollars; and in the case of an infringement of a copyrighted dramatic or intringement of a copyrighted dramatic or dramatic-muiced work by a maker of motion-pictures and his agencies for dis-sibilition thereof to achipitors, where such infringer shows that he was not aware that he was infringement could not reason-sity have been forcessen, the earth's stra, of such damages recoverable by the copy-right preparation from soid infringing maker and his agencies for the distribution that the contract of the contract of the con-traction their shall not kneed the run of five thou-sisist delibers not be seen than two plushests said effect of the seen of the seed of the first delibers. It, is size questions that he give that the foregoing two properties that he gives the seen of the properties of lary reflections of the seen of the seen of the properties of the seen of the seen of the properties of the seen of the reservery singly to infringenments coursely deliber the services are the seen of the seen o

## Dry Cleaner for Windows, Mirrors and the Like

I is frequently desirable to clean glass in windows, mirrors, picture frames, show cases, and the like, without the use of water or other liquids which are liable to drop or be spattered in the operation.

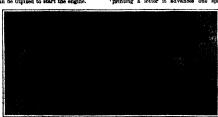
An inventor has recently hit upon the scheme of cleansing the window dry cleansing material, which is rubbed



over the glass and which removes all dire The cleansing materia is placed on a band of cloth supported in a frame similar to that shown herewith. The cloth band is wound on two rollers and may be fed from one to the other whenever it is desired to bring a fre surface into play At the point of application the cloth passes over a felt-covered plate. Directly back of this plate is a such particles of dirt as adhere very strongly to the glass With this device the glass can be cleaned without the use of any liquids.

## Starting an Engine Pneumatically

JOHNA. HEANY, Washington, D. C., has secured a patent, No. 1,029,994, for an apparatus in the nature of an engine starter hich includes, in connection with a pr sure tank, a pneumatic appliance which is sure tank, a pneumatic appliance which is convertible from a motor to a pump and is located between the pressure tank and the asgine shaft. Differential gearing is pro-vided between the tank and the shaft and automatic clutches for the gearing, and means are provided for automatically throwing out the pumping gearing and locking such gearing out of sotion in order to convert the apparatus into a motor upon the attainment of a predetermined pressure. the attainment of a predetermined prethe attainment of a predetermined pressure in the tank. Thus, in operation, the pump acts to produce pressure in the tank and then when a certain pressure is attained the pump is thrown out of action and the apparatus is converted into a motor which can be utilized to start the engine.



A norbit tracuritor of the form and size of a big watch.

## Door-fastening Device

EVERY now and then a patent is issued upon an emergency device for locking doors, which would seem to indicate that there is a considerable demand for such an appliance. No doubt travelors fre-quently find themselves in hotel apart-ments inadequately equipped with locks venient to have a pocket device for se curing the door against intruders. The accompanying illustration shows a door curer consisting of a flat key formed



with sharp teeth along each edge, mounted to turn within a yoke is turned to the plane of the voke, and inserted between the door and the Jamb Then it is turned crosswise to wedge the sharp teeth into the wooden door and its frame. It is impossible to open the door under such conditions without tearing out

## A Pocket Typewriter

THE adoption of typewriters has within a few decades revolutionized the whole of office management and practically supplanted handwriting for commercial and

Recent inventors seem, however, not to be content with this widespread success of the writing machine but wish to extend its use even further These endeavors have on one hand resulted in the production of exceptionally light typewriters reduced to minimal dimensions, which can be readily carried about when traveling, and on the other hand in the invention of cheap type writers suitable for those whose corres-pondence is too limited to warrant the purchase of a standard machine

One of the most notable productions in this line is the pocket typewriter invented by Mr. Albert Fink. This has the form by Mr. Albert Fink. This has the form and dimensions of a big watch comprising on its dial the letters of the alphabet, the numerals and the signs. Its manipulation is extremely easy, the whole machine being alightly pressed against the paper after the proper letter has been adjusted for After printing a letter it advances one space

long the rack traversing the watch-like attachment, which also carries at its back edge the paper to be typed on With some practice one gets up a certain, though of course modest, speed

The whole arrangement is simple and the price of course only a small fraction of the cost of even the cheapest regular typewriter regular typewriter The principle used in connection with this machine is the same as that on which the very first typewriters were based.

#### Notes for Inventors

Protection of Metal Against Rust .-- It is possible that some day, some one will invent or produce some means or method. or both, of preventing the destructive rusting of iron and steel embedded in the earth Such an invention should be profitable, as it would make permanent and overlasting milhons of tons of metal, which, under present practices, must be replaced after a few years use.

A Paper Stencil.—Sterling Elliott of Newton, Mass, in patent No. 1,034,690, shows a simple stencil strip from which stencils may be cut. It consists of a folded stencils may be cut. It consists of a folded strip of paper with holes arranged in pairs so they will register when the strip is so they will register when the strip is folded and a second strip of paper arranged between the folds of and pasted to the folded strip with both strips solidified and stiffened by the same adhesive substance.

Churning Butter by Air Currents.—A nethod of producing butter has been patented to Alpheus Fay of Louisville, Kentucky, No 1,034,350, in which ebullition is produced in the body of the milk by the tangential collision of two volumes of air, the vessel having unobstructed concave walls. The ebullition is produced for a period of from 30 to 60 seconds

Milking by Pedal .- A new milking machine was recently exhibited at the Royal Show at Doncaster, England, and at-The feet instead tracted much attention of the hands are used for milking operator sits on a tricycle seat and pedals, drawing the milk from two cows simultaneously Twenty to twenty-four cows can be milked in an hour by one milker with a cowman in attendance

A Sound Muffler for Telephone Boothe -- In patent No 1,033,963, Edwin M. Sur-prise of Boston, assignor to American Telephone and Telegraph Company, present so formed as to muffle the sound from within the booth. In the construction shown in the patent, the tube is provided with slots and with baffle plates secured in the slots and projecting partly across the tube and having flaced edges over which the air current passes

Why Not a Trunk Carrier? - Have you ver noticed the terrible strain upon the men who carry heavy trunks up and down stairs on their backs? Trunks do not seem to decrease but rather to merease in size. Surely there must be a limit to human en-durance. It is in order for someone to devise a means whereby the transfer man will be relieved of some of his burden

## Trade-mark Notes

"Boy Scout" Not a Registrable Trade-mark. -Commissioner Moore in the case of ex parte Warner has held that the words "Boy Scout" are not registrable as a trade-mark for leggings, gloves and mittens, since s applied to such goods the mark is either deceptive or descriptive

"Hygeia" as a Trade-mark.--Assistant noner Tennant has held that the word "Hygeia" as a trade mark for coffee is not descriptive The decision was ren-dered in the case of Levering Coffee Company v. Merchants' Coffee Company.

## RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising. Department of the SCIRETIFIC

#### Pertaining to Apparel.

COLLAR AND THE RETAINER.—C. A. Bunder, and the state of the state of a retaining attachment for turn-down cloth collars, and is designed to engage post tivit with both the ends of the collar and the lit of the wearer in order to hold them in proper potition relatively to each other

the alterous being plane in cross section ARROHANE.—Atlank F Permi cc., 1208 Clay Avc., Bronz, New York The seroplane invented by Mr Petrucch has, in addition to the ordinary propeller, a horizontal propeller may be used to seast in the internal propeller may be used to seast in the internal propeller may be used to seast in the internal propeller may be used to seast in the child levitation of the machine and in its



TICAL PROPELLERS.

alighting Means are provided whereby the two propellers may be selectively discontinued or operated. The acropiane is further provided with steering apparatus adapted for operation to after the line of flight. It certice planes that operate as self-righting members to pre-serve the equilibrium of the machine in af-The perspective view is of the acropiane as seed from the rear.

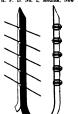
## Of Interest to Parmers

of flaterest to Parimers.

ALAIM FOR INCULATORS AND BROODEIRS—J. TRAFT, R F D No. 5, Valley Palls.

Kan The aim of this invention is to provide
an alarm which in the event of a variation in
the temperature within the incubator will
be automatically sounded, notifying the attondant, who may at once give the necessary
attention thereto as the conditions may reouter.

FENCE POST -- POSTER KINNE BUSHNELL BOX 121 H. F. D. No. 1. Medina, New York



PENCE-POST OF SIMPLE DESIGN.

As illustrated herewith Mr Bushnell's feace-poot by constructed of metal in the form of an angular channel faring at the bottom to form feet that will provide a firmer hold in the poot hole. The wires of the fence are caught in notrhed boils which pass through the corner of the fence-post and through blocks of triangular form fitted against the rear side of the post

rear side of the post
COTTON PICKER—II SKARE, Tamaroa
III This cotton picker is arranged to readily
remove or pick the ripe bolls of cotton fron
the plants without danger of injuring the



foliage or blossoms and permits of repetited use to gether all the belle as they gradefully use to gether all the belle as they gradefully the plants upward to the stop thereof. For this, use is made of all propellers arranged to pass sings the bower positions of the plants and forcing an air bleat upwardly against the bolls to detect the same the plants for receiving the detached bolls. The engraving represents a longitudinal control section of the picker.

MILKINO MACHINE—O. C. SIRLEARY, Algons, Wis. The invention pictured in the lilustration in sectal use, provides a machine proformed by compression rather than by suction or stripping, provides a device detachable so as to accommodate it for use in con-



MILKING MACHINE.

nection with different size cows or those hav-ing different size udders; provides an actuator for the milker which is adjustable in accord-ance with the size of the texts, and provide an initialize method in which the compression cups are formed and operated so as to simu-late the form adoptration of a person's band in hand milking.

#### Of General Interest.

Of General Interest.
FOOD PRODICT P. II MENEZ, 714 Hannen Hidg. New Orleans, La. This Invention has reference to certain improvements in food products for animals, and the object of the invention is no provide a food product of a invention is no provide a food product of a food product of a food provided and service by the provided provided and service by the provided p



BARREL HEATER.

FUNNEL—John J Lacv, 370 New Street, Furnel division of the form of the first sade in filling a bottle and more liquid is poured in than the bottle will hold it impossible to save that liquid which remains in the cup of the funnel. When the funnel



is removed the liquid pours out and is foot. The present investion provides a value at the lower and of the frame true which is operated by a handle or hand laver projecting the law of th

BMOKE-FIUM BABE.—W. A. Daox, 105
Buens Vista St., Newark, Ohio. In carrying out
the objects of the improvement, a single
block is cast of concrete or constructed in
any desired manner, arranged with a projecting lower portion for engaging the interior
part of the chinney, and an upper equanel
portion for engaging the exterior part of the
chinney. Baddating from the upper part of the
chinney. Baddating from the upper part of



SMOKE-FLUE BABE.

the block is a substantially circumferential fange which defines a pair of over-hearing and the state of the state of

Hardware and Tools.

CLAMP.—J. Vandsvide, R. F. D. No. 2.

Critian, N. Y. The leveration comprises a substantially U-shaped frame, with a thum serve monated in one arm of the frame and movable toward and from the other arm. The arm carrying the serve has a special forms tion to constitute a split nut, so that the



Jecta a heating device arranged to extend through the bungdole of a keg or barrel so that when the route or great on that when the route or great of the third of the third of the third of the third of the water on a tun quickly congulate or solidify. A perspective of the control of the children of the water on a tun quickly congulate or solidify. A perspective of the control of

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Japany No. 1875. Wanted name and saldsung

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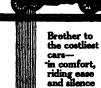
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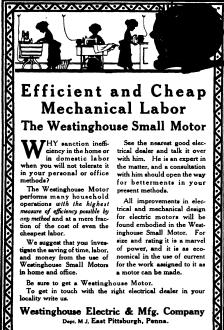


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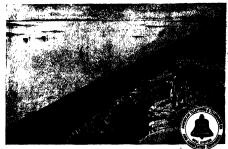
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The Gordon Bennett Contest (Concluded from page \$46.)

minium to cleave the air with minimum

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seems excessively blunt to be of good stream-line form. This might be remedied by more pronounced tapering of the wind shield jutting before the propeller. Unfortunately, the revolving cyl-inder motor, with its outer diameter of 34½ inches, seems necessarily to imply a large body resistance. With a watercooled motor entirely housed in a welltapered bow, and with the radiator sur-face on the outer side of the hull, the body resistance might be much reduced. There seems, therefore, to be much im-provement possible in the aerodynamic provement possible in the aerodynamic features of this machine. But even as it stands, Vedrines predicts that by using his smaller racing wings he will be able to attain a speed of 125 miles per hour. He did not use these small wings because he was not pressed by serious competition in the race.

Little need be said of the 100 horse power Deperdussin piloted by Prevost except to note that its average speed for the entire course was 100.05 miles per hour, as against Vedrines' record of 105.0 miles an hour. The propeller measured 2.40 meters in diameter by 2.60 meters pitch. In general appearance and in structure and control, it was like the

The Harriot 100 horse-power mono-plane, prioted by Frey, bears a very close esemblance to the well-known Nieuport with its quadrangular-sectioned fuselage ing chassis. But it has too much resist-ance, and is too slow for the best speed. When overhauled in its course by the smaller Deperdussin, their difference of

smaller Deperdussin, their difference or speed was very manifest to the eye. The result of the contest, while some-what disconcerting to Americans, will, it is hoped, benefit them. The wonderful dying of the French attract, and the help-lessness of the Americans with their untried and hurriedly-built monoplane, proved a dramatic and severe less the need of scientific and systematic preparation, as well as of effective team play. If the contest had been waged for command of the air against a great military power, such defeat would have been sad.

Vedrines aftirms that the greatest difficulty confronting the designer of ra aeroplanes is to provide for safe landing. Even at his present speeds he thinks the landing too dangerous. He contemplates a design which will admit rising and landing at moderate velocities while allowing much greater speeds well above the ground. The problem is to adapt the wings to lift the machine at moderate speeds and again no more than just sustain it at the maximum speed in regular

Playing Polo With Stripped Cars IN Wichita, Kans., a number of expert automobile drivers indulged in a game of polo recently, in which the part of the nonies was taken by stripped motor cars. The game was played in three 10-minute series, to a 1-1 tie score. The goals were 60 feet apart, and in the whirlwhild driving one of the cars turned a complete somersault, without, however, injuring somersau anybody.

# Popular Flying Machine Subscription in Italy

By popular subscription funds have been placed at the disposal of the Ital ian government for the donation of a fleet of one hundred aeroplanes. All told there are about ten aeroplane factories in Italy. Some of them would undoubtedly profit by this normar interest in the military

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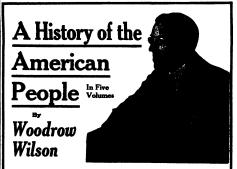
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# The Chemical Congress

I For the first time in history the International Congress of Applied Chemistry has met here in the United States.

Among our guests are some of the most distinguished men of the profession-men whose work will be written in indelible characters in the record of the industrial and scientific advances of our age.

Such an occasion demands our special notice and attention.

Several pages of the current issue of the Scientific American Supplement have therefore been devoted to a general survey of some of the chief papers presented before the Congress. A number of articles specially selected from among the seven hundred odd contributions made to the Congress will also appear in the current and subsequent issues of the Supplement.

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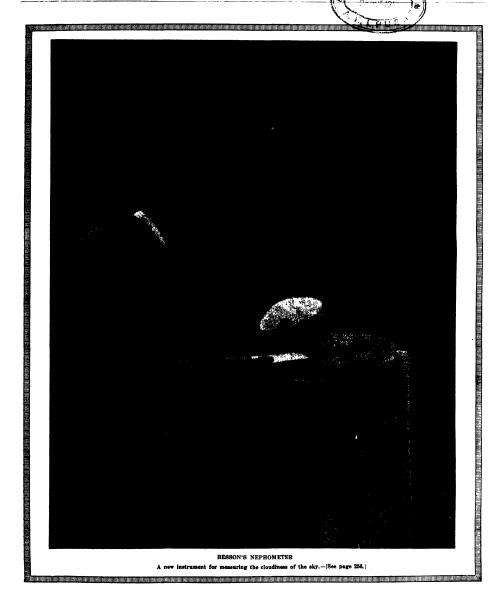
# SCIENTIFICAMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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#### SCIENTIFIC AMERICAN Founded 1845

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#### Munn & Co., Inc., 361 Broadway, New York

The Editor is niways glad to receive for examination illustrated articles on subsects of timely interest. If the photographs are story, the articles stort, and the facts authentic the contributions will receive special attention Accepted articles will be paid for at

The purpose of this journal se to record accurately. simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### America and the Gordon Bennett Cup

UR request for correspondence on the question of the causes of our inability to make any defense of the Gordon Bennett Cup has met with a quick response from one who is pre-eminently qualified to speak with authority on this subject. Mr Charles M Mauley, whose letter appears on another page, was the engineer associated with Langley in the classic experiments in flying made over the Potomac River. His contention that the difference between rican and French machines is largely one degree of excellence of workmanship, comes with particular force from the man who designed and built the beautiful and extremely light motor for the Langley aerodrome, which is at present in the Smithsonian Institution, Washington Mr. Manley usks: "Is not the progress which our inventors and builders have the progress which our inventors and manages sur-made in hydro-neroplanes fully as important as the more spectacular achievements in speed?" Undoub-edly, next to the work of the Wright brothers in giving to the man-carrying motor-driven aeroplane, that of Curtiss, in producing the first practical hydro-aeroplane, is the most important contribution to aviation, certainly in this country and possibly in the whole world Mr Manley evidently considers the dearth of capital in the seroplane industry is not chargeable so much to the capitalist as it is to the United States Government. That is to say, if our Government provided appropriations of a sufficient amount to justify the manufacture of aeroplanes on a liberal scale, just as the French government has been doing, it is probable that capital would regard the aeroplane industry an attractive field for investment.

#### Good Rails and the Rail Mills

Which will be found in conwhich will be found in our correspondence columns, from an authority on the subject of steel manufacture, dealing with the subject of the manufacture of reliable steel rails. By way of comment on Mr Wellman's letter, we invite attention to

As a result of the alarming increase in rall fatiures which occurred a few years ago, the subject was taken up by the American Ratiway Engineering Association, who formed a committee composed of eminent rati-way engineers and representatives of the rail manufacturers, which was instructed to make an exhaustive investigation. The report of this committee was recently made public. A careful reading of this report and particularly of the papers presented in this city at the recent International Congress for Testing Ma-

terials, points to the following conclusions:

The claim of the railmakers that a reasonably high percentage of carbon is responsible for piping and the breakage of steel talls is not established by the latest expert evidence.

R. Trimble, Chief Engineer of Maintenance of Way, N. W. System, Pennsylvania Lines, as a result of an investigation of statistics from el., http-tour railroad quales, relating to 12,893,007 tons of rail failures, companes, conting to 12/88/007 tons of rall failures, bads that "difference in carbon does not account for variation in rate of failure." This statement was home out by a confidential report of one of the largest raliform systems in the country, in which there appears to the country of the largest raliform of the country. the following conclusion based on a study of failed rails on that system for a period of three years: "in-crease of carbon has not caused an increase of rail failure due to brittleness, but the reverse."

Aithough Mr. Wellman is undoubtedly correct in stating that a liberal discard (cutting off of the inrefor top of the ingoty will not entirely remove all piping. It cannot be denied that the chance of having defects in finished rails is much reduced by a liberal discard. This is shown by the paper of J. R. Onderdonk, Engineer of Tests, Baltimore and Ohlo Onderdonk, Saignaser of Tests, Baitimore and Ohio Railroad System, in the same report of the Committee on Rails: "Being one of a committee to investigate this subject in 1905," he says, "we visited the different rail milis and were rold that this defect—split rails was due wholly to not having had the proper top dis-card;" and at the conclusion of his paper, he says: The blooms should be cut back until solid metal is reached; which does not seem to be accomplished with the present method of shearing," in which a uniform percentage of discard is used for all ingots irresp tive of their quality.

That alloy steel will solve the question of proper rail manufacture is not only open to doubt, but the tests so far made have proved that any improvement in some directions from the use of alloys may be a than compensated by troubles in other directions. chief engineer of one of our leading railroads informs us that he found nickel steel, for instance, to be unreliable. On the subject of titanium steel, of which we hear so much to-day, we have, as a guide, the recent investigation made by M. H. Wickhorst, Engineer of Tests, Rail Committee, dealing with the subject of pipe-less ingots. In his summing up Mr. Wickhorst says that "while the use of one tenth of one per cent or e of metallic titanium prevents the honeycomi conditions; . . . it is also attended with larger and deeper pipe. . . Large internal flaws were found in ralls considerably lower down from the top of the ingots in steel treated as mentioned, than in rails made from plain steel."

That the use of heavier rails will be a cure for breakages is disproved not only by the wide experience of American engineers, but by the report already men-tioned on the investigation of over ten million tons of broken rails, among the fludings of which we notice this. "The average performance of the heavier sections is not so good as the average performance of the lighter sections," which to our mind is at least a sug gestion that the lighter ratis of an earlier date of manufacture were made with less haste and greater

That the railroad companies are sincerely de of obtaining a higher quality of rail, even at a higher cost, is shown by the widespread advocacy of Open Hearth in preference to Bessemer rails. The superiority of the Open Hearth product is generally acknowledged among railroad engineers. Thus the report of the Committee on Rails says in its conclusion: "The Open Hearth rail as a whole shows a lower rate of failure than the Bessemer."

Summarizing the findings of the Rail Committee's report, and of the excellent articles presented at the recent congress in this city, there seems to be a general consensus of opinion at the present time that the quesus of opinion at the pres tion of such details as chemical composition section and weight of rail, use of alloys, and the nature of the track maintenance, are subordinate to the greater ques tion of uniformity of product and the general character of manufacture at the rail mills. The Scientific of manufacture at the rail mills. The Somentific American is still of the opinion that the question of securing sound rails is a question of greater care and less hurry in the process of manufacture. Improve ment should be in the direction of cutting off from the ingot all that part of it which contains segregated and all that part of it when contains segregated material and plping, the casting of smaller ingots; and the more thorough working of the metal during the process of rolling. The Germans have shown us that, at some increase in the cost, piping may be practically eliminated. Why have our rail manufacturers not taken cognizance of their methods? The whole subject of method of manufacture was

excellently summarized in the letter of M: Richards Chief Engineer of Maintenance of Way of the Pennsylvania Ralirond, of June 22d, 1911, addressed to the sylvania Ralirond, of June 22d, 1911, addressed to the American Raliway Engineering Association. He be-lieves that a good rail can be made "If the mill prac-tice be right." This option was reiterated at the re-cent congress by Robert W. Hunt, president of the American Nociety for Testing Materials, who protests against the present method of using large heats of 300 ions, and expresses his belief that "I' a positive neces-tions, and expresses his belief that "I' a positive necessity for sound ingots be commercially established commercial way to produce them will be found."

#### Gyroscopic Action in Aeroplanes

HE question of the effect of the revolving motor upon the equilibrium of the geroplane is again brought up by the letter of Mr. Brooke published in our correspondence columns. Although the

subject has already received con even to the extent of having been made the subje-investigation by the French builders of recoiving investigation by the French builders of revolving me-tors, it has been suggested that the matter should be taken up by a committee of impartial investigmade the subject of exhaustive tests. The mily. gyroscopic effects should exist; indeed, the makers have admitted that there are such effects; though they naive that they are of so slight a character as not or constitute a source of danger. According to our op-respondent, the late Paul Peck admitted that he had troubled, though not to any serious ex this action. Evidently, in common with Earle Oving ton and other successful flyers, he did not consist that gyroscopic action was of sufficient violence endanger the stability of an aeroplane in flight. It is conceivable, however, that although the effect is negligible in caim weather and during normal flying, it might prove to be the last straw in producing an upeer, due primarily to other and larger disturbing influences.

#### The Nature and Origin of Life

HERE are problems in science which are es-sentially modern, and which could not have been even conceived in the minds of the ancients. There are other fundamental problems, which have exercised the minds of thinkers of all ages, and which still remain to baffle the most advanced workers in the fields of modern science. Of such is the problem of the nature and origin of life, selected by Prof. E. A. Schaefer as the topic for his inaugural address before the British Association at Dundee, which we present

in abstract on another page of this issue.

All attempts to "define" life are more or less fail-"The ordinary dictionary definition of life is the state of living. Dastre, following Claude Bernard, defines it as 'the sum total of the phenomena common to all living beings.' Both of these definitions are, however, of the same character as Sydney Smith's definition of an archdeacon as 'a person who performs

onal functions."

The fact is that such attempts are based upon a logical blunder: the fact that a certain word has come into general use in popular language, does not in any way guarantee that there exists a corresponding ob-jective counterpart. If an example is necessary to illusrate this, we need only remind the reader of the word "ghost." Some of us may "believe" in ghosts, but at any rate that existence is not proved. Nimilarly, to argue that because the word life exists, therefore it must be possible to precisely define a certain objective and clearly circumscribed set of phenomena correspond-ing to that term is fallacious. This would imply that those who, ages ago, first framed the word H<sub>f</sub>, in some ed an intimate knowledge of these phenomens—a knowledge which we in our day are far from being able to claim. Prof. Schnefer is careful to avoid entanglement in hopeless "philosophical" quibble. He attempts no definition of life, but dismisses "I am not myself proposing to take up your time by attempting to grapple with a task which has proved too great for the intellectual giants of philosophy, and I have the less disposition to do so because recent advances in knowledge have suggested the probability that the dividing line between animate and inanimate matter is less sharp than it has been regarded, so that the difficulty of finding an inclusive definition is correspondingly incre

#### Dropping Bombs on Balloons and Targets

HE recent events at Gotha showed that bomb dropping from aeroplances is not an easy matter. Prizes of \$2,500, \$1,000 and \$400 are awarded to pilots who fix at 660 feet height and drop the greatest number of bombs in a square of 330 feet, as we already mentioned. The target represents a military bivousc. Two prizes of \$750 and \$400 are awarded for dropping bombs upon a captive balloon anchored near the ground, the aeroplanes to fig at 165 feet at least. During the events the first pilot to try his skill was flanuschke, but he was not able to place any of the homiss upon the captive balloon, which had the form of a Zeppelin. Lindpaintner then made a flight, and when at 800 feet height he dropped hombs upon the 830 feet square target and was able to place seven of these in the mark. After an attempt made by Kaspar, whose aeroplane made a had landing and was heapar, whose aeropiane made a hed landing and was smashed to pieces, Palmorburn flew with his machine and dropped three bombs, but only one of these hit the mark. Bell dropped two projectiles, placing one of them lands. A Jens establishment has designed and mult a sighting device which is composed of a te scope, a graduated scale and a watch. After recket ing the approximate speed of the aerophine or airship, its height, and also the height of the target with reference to the sea level by the use of a map, the pilet, taking the speed of the wind into account, sights the speed ject by the telescope, and lets the bemb drop by me

The John Welling W. S.

#### Engineering

The Madeira-Mamore Railway, the construction of which has perhaps attracted more attention from the world at large than any other railway enterprise in South America except the Transandine, was opened at Porto Zelho on September 7th, 1912.

Terminals for the State Canal.—The New York State Canal Terminal Commission has adopted plans for an extensive system of dools, piers and warehouses, along the State Barge Canal, the total cost of which will be about \$20,000,000. A New York it is proposed to have terminals connected with the projected elevated freight railroads along the Hudson River, Manhattan Island, which is advocated by the present Dock Commissioner.

Lake Submariaes for the Navy.—The Lake submarine, built for the United States Navy, has recently undergone successful trials, in which she exceeded every contract requirement. Her surface speed was 14.7 knots, and submerged, just under 11 knots. She was run over the mile course at a predetermined dopth from which she did not vary two feet. This vessel holds the record for deep submergence, having reached a depth of 286 feet with her crow aboard.

The Turkines of the "Nequine." —We are informed that the trouble with the "Neptune," which by the way, has not been rejected by the Government, is that the turnism were over large for the work they had to do and therefore did not show the seconomy which had been expected. The "Neptune" is to be taken over by the Government, and orders have been issued to put the wessel into commission and run her until the new, high-speed marine turbines, which are being built by the contractor for the ship, are ready.

Government, and orders have been issued to put the vessel into commission and run her until the new, high-speed marine turbines, which are being built by the contractors for the ship, are ready. —
Trackless Trollers on Long Island.—We understand that plans have been consumed of for the use of the trackless trolley at Flushing, Long Island. The trackless trolley at first successfully introduced in Germany, at which time it was illustrated and described in our columns. The main advantage of the system is the saving of cost due to the elimination of the tracks, and the great facilities of operation, the whole width of the highway being available for all vehicular traffic, whether horse-drawn or motor-driven.

Lecemetives as Pite Bagines.—Ton years ago, the Pennsylvania Bailvand commenced to use railway loos-motives as fire oughnes. To-day there are 612 engines in yeard and evidenting service equipped with special fire-flaghting appearatus. The standard equipment for any flaghting appearatus. The standard equipment for the bosometrie consists of 100 feet of 25-jenho hose and a 15-inch east iron nozzle with a 5-jenho disabarge opening, kept in a box under the running board of the origine. With this equipment engine can throw a stream of water 70 feet. The vater is drawn from the tender and it disabarged through an ejector by steam from the locom-trials of the contract of the contract

A 38-knot Destroyer.—The Russian destroyer "Norki," according to Bagneserine, as stated to have exceeded 30 knots on hor official trials last month. The vessel, which is 336 foot long by 31 feet 6 inches beam, is of 1,280 tons displacement, and was built at 8t... Petersburg, the machinery constitute of A. E. O turbines and oil-fired holiers, being supplied by the Vulcan Company, of Stottin. The designed speed was 35 knots with 36,000 shaft horse-power, but both have been considerably exceeded. Thus vessel, should the report be correct, is the swittest destroyer afloat, exceeding the speed of the British destroyer "Swift."

Our Biggest Battleship.—The one battleship authorized by Congress will be considerably larger even than our latest ships. Her displacement will probably work out at between 30,000 and 31,000 tons. Dapatokes from Washington state that the length of the ship over all will be considerably over 600 feet, the beam about 86 feet. She is to carry twelve 14-inds guas or two more than the "Oklahoma" and "Nevada." The armor of the "Pennsylvainia," as she will be named, will probably be not less than 16 inches on the belt, turrets and barbetes. Her side armor will be placed in deep, horizontal stripe, and, the base of her single smokestack.

Vast Subway Extensions for New York.—The amazing rate at which subway travel is increasing in this city has led to a more genesous plan on the part of the Public Service Commission for future, extensions of the road. The Commission states that the estimated cost of the new developments will be not under \$359,000,000. They estimate that the total length of the single tracks in the whole system including the existing subway and elevated lines in Manhattan and the Bronx and the Rapid Transit slines of the Brooklyn Rapid Transit Company will be six hundred and twenty-nine miles, as against the length of two hundred and ninety-six miles of the existing line. In the year enting June Soth, 1911, about eight hundred million passengers were carried. When the new system has been built, the total capacity will be upward of three billion pas-

#### Science

A New Comet.—We have received an announcement from Harvard College Observatory to the effect that Cale and Sydney discovered a comet on September 8th, 1912, in right ascension threton hours, thirty-save minutes, one second and declination minus hirty-sax degrees, thirty-one minutes and two tenths of a second.

Moving Pictures That Talk.—There was recently exhibited in Philadelphia the invention of Dr. Isadore Kitsee, an invention which is a very creditable attempt to produce talking moving pictures. Dr. Kitsee first tatseked the problem in 1905. Just how Dr. Kitsee has succeeded in synchronizing a phonograph with a film we are not as yet able to reveal; but in a future number we hope to publish an article in which the invention will be discussed in more or less detail.

Pollshing Metals.—All metals are very effectively cleaned for polishing by using a pasty solution of rotten-stone and spirits of turpentine. This removes grease and is very effective against the coride and sulphides which tarnish the metal and prevents effective polishing. After the application of the paste, it should be cleaned off by a dry cloth and the metal polished by any good means, polishing wheel, or a flannel cloth which is most effectively used.

Redacing the Brittieness of Glass.—The brittleness of class is due to the quick cooling of the hot substance it is known that constant motion tends to rearrange the molecule in any substance and a similar effect is observed when glass is boiled in a week solution of salt in water, and allowed to cool gradually. The toughness of the glass is moreased very much, and the effect of quick heating is less disastrous to them. This is easily applied to articles used in the laboratory and to glass globes for lighting purposes, and prevents much breakace.

Women in German Universities.—The number of women students in the German universities is on the increase, and during the recont half-year there were 2,958 students on the list. These are distributed as follows: In the Prussan universities, 1,962, in the two Baden universities, 147, and for the others in the German empire, 300; 2,600 of these students are of German antionality, 1,835 of them are following the courses of literature and history, 539 are engaged in natural seiences and mathematics, 625 in medicine, 74 in political economy or agriculture, 30 in law study, 28 in dentistry, 71 mpharmacy and 11 in theology.

The Influence of the Cinematograph. —A striking illustration of the miluence of the bulgatious cinematograph is reported by the American consulate at Belgrade American fashions have recently become very popular with the young men of that city; there is an unprecedented demand at the local shops for hats, boots, and other wearing apparel similar to that in vogue in the United States; and the American style of hair cutting has come into favor. These innovations are unmistiably the result of the orbitistion of moving petures of American origin. The obvious moral of all this, as the tonsel points out, is that the informatograph might be used to great advantage in advortising all kinds of American products. For instance, pictures of American agricultural machinery in operation would probably create a great domand for the thing twiff. This plan offers an economical substitute for the actual exhibition of American products in commercial measures and the limits.

Synchronous Weather Maps for Eurasia.—The first, step in making a scientific woather forcoast is to draw a chart, based on telegraphic reports from meteorological stations, showing the distribution of pressure, temperature, clouds, winds, etc. The observations on which the that is based should be as energy smultaneous as possible; and, as forceasters have recontly come to realize, it is also destrubed that the chart is based in the control of the meteorological service of Russia, General Rykachev, has just laid before his official collectures of other countries a plan for the insugariation, beginning with the year 1915, of a system of strictly simultaneous telegraphic weather reports, twice a day, from stations scattered over the whole continent of Eurasia, and also from lockand and the islands of Japan. At present simultaneous observations are swilshle from all parts of Europea but the stations of 8theris, and there is no general exchange of the Asiation observations by telegraph. The "term-hours" proposed for the new system set? A. M. and 7 P. M., Greenweld time. The weather maps based on these observations would extend more thank way round the globe. It is proposed to publish the evening map in the Buropean newspapers of the next morning, and the morning map in the afternoon papers. The great utility of such a plan is attested by the experience of the United States Washer Bureau, which now prepares a daily chart of telegraphic observations from a company of the size of the size of testions extending around company of the size of the size of testions extending around company of the size of testions extending around company of the size of testions extending around company of the size of the size of testions extending around company of the size of the

#### Aeronautics

Aeropianes Cannot Land in Paris.—The French Prefect of Police of the Seme Department has issued an order forbidding aeroplanes to land within the limits of the city of Paris. They are also forbidden to descend to, or assend from, ground stunded moare than 500 meters (1,640 feet) from any inhabited building, excepting authorized serodromes within the entire district of the Seme Department.

Aviation School for Australia. An aviation school will soon be opened in the Australian city of Duntrom under the auspices of the British War Office. The Australian Minnster for Defense ordered two hiphanes and two monoplaunes, and two aviators have already been chosen to plot them. Further machines are to be added from time to time, the description from the ending the property of the fiving corps at the State capitals and other important points.

Paddle Wheel Propeller for Aeroplanes, Joseph Clarkson, of Mannelester, Eige, last month mude a series of highly successful experiments with a novel form of propeller. Instead of using a two or three-bladed "fan" are "series," he employs what corresponds to a steames" a paddle wheel. His tests were made on a light automobile for the purpose of measuring roughly the drivings power, and it was found that an inverse of 50 to 70 per event was obtained over the same engine with "series" propeller—secording to the inventor.

Military Aviation in England.—The question of army acroplanes is making great progress in England just at present. Owing to the good results in the acroplana part and flights made at the recent military competition, a bill is to be presented to Tarlament for organizing a vertiable part in this enterprise, spread funds for pensions and in-surances are to be set apart. It is intended to increase marines are to be set apart. It is intended to increase the a replane material of the army to a great extent, and this will be seen from the fact that the budge to for 1911–12 provided a credit of only \$4050,000, while the budget of 68 fleets, and 70 these include 12 acroplanes each The remaining fleet consists of acroplanes and airships. The officers will go through plot truning at the Salisbury Plan or Eastchurch grounds, but the second of these ortalishalments is mainly used for marine avoidablements of the second of these or and the second of the second of

Howard Gill.—It is with deep rigget that we record the death of Howard Gill at Chinge, on Replember 14th Gill's machine was run into by that of George Mestach Both machines were sent creshing to the ground forty feet below. Gill's machine turned over in the fall barying the avaitor beneath it It caught fire immediately after striking the ground. Mostach was string a Bord monoplane and Gill a hylane of the Burgeo-Wright type. Mostach was a trifle behind Gill and apparently was endeavoring to pass alove him, of the other control of the string of the strike S

A New Allitude Record.—On September 17th George Logagneux established a new world's reword for allitude for monophoses at the Subscending Secretary. It is a standard in the second of t

# New Methods of Measuring Clouds

The Work of Besson at Montsouris Observatory

 $\Lambda^{T}$  many meteorological observatories the movement of clouds is measured by means of Fineman's nephecope. This instrument consists of a magnetic compass, the case of which is covered with a black mirror, around which is movable a circular metal frame. little window in this mirror enables the observer to the tip of the compans needle underneath. On the surface of the mirror are engraved three concentric circles and four diameters, one of the latter passes th the middle of the little window. constitutes a compass card, its radii corresponding to the cardinal points. On the movable frame surround-ing the mirror is fixed a vertical pointer graduated in millimeters, which can be moved up and down by means of a rack and pinion. The whole apparatus is mounted on a tripod stand provided with levelingscrews To make an observation, the mirror is ad-justed to the horizontal with the leveling-screws, and is oriented to the meridian by moving the whole appa ratus until the compass needle is seen, through the window, to lie in the north-south line of the mirror (making, however, allowance for the magnetic declina-tion). The observer stands in such a position as to bring the image of any chosen part of a cloud at the center of the mirror, and the vertical pointer is also adjusted by screwing it up or down and by rotating supported by servening it up or down and by rotating it around the mirror until its tip is reflected in the cen-ter of the mirror. As the image of the cloud moves toward the circumference of the mirror the observer and the cloud image in coincidence. The radius along which the image moves gives the direction of the cloud's movement, and the time required to pass from one circle to the next its relative speed, which may be reto certain arbitrary units.

This instrument is, however, not very easy to use, and gives only moderately accurate measurements.\(^1\)
Accordingly M. Louis Bessou, the able director of the Observatory of Montsouris, invented his "comb nepho-(Fig 1) in order to secure more accurate determinations of the direction and velocity of cloud move-This apparatus consists of a horizontal bar with several equidistant spikes and mounted on the upper end of a vertical pole which can be rotated on its axis. When an observation is to be made the of the acts when an observer has a position that the observer places himself in such a position that the central spike is projected on any chosen part of a cloud. Then, without altering his position, he causes the "comb" to turn by means of two cords in such a manner that the cloud is seen to follow along the line of spikes A graduated circle, turning with the vertical pole, gives the direction of the cloud's motion; it is read with the aid of a fixed pointer. Moreover, when the apparatus is once oriented, the observer can deter-mine the relative speed of the cloud by noting the time the latter requires to pass from one spike to the next. If the instrument stands on level ground, so that the server's eye is always at the same height, and if the interval between two successive spikes is equal to one tenth of their altitude above the eye-level of the observer, one need only multiply by 10 the time required for the cloud to pass over one interval to determine the time the cloud travels a horizontal distance equal to its altitude

M Besson has also revived an old method of Bravais for measuring the actual height of clouds. The apparatus in this case consists of a plate of glass having parallel faces, mounted on a graduated vertical circl which indicates its angle of inclination. A sheet of water (Fig. 3), situated at a lower level, serves as a mirror to reflect the cloud. The water is contained in a reservoir of blackened cement surrounded by shruibery, and is only a small fraction of an inch in depth, so that the wind may not disturb its level surface.

The observer, having mounted the glass plate on the horizontal axis of a theodolite (Fig 2) set on a win-dow sill some 30 or 40 feet above the ground, places his eye close to it and adjusts its inclination so that the images of a cloud reflected in the plate and in the sheet of water coincide. Then from a curve traced the sheet of water concate. Then from a curve taken-one for all on a sheet of plotting paper he reads off the altitude of the cloud corresponding to the observed angle of the glass plate. The curve is plotted from simple trigonometrical calculations

At the Observatory of Montsouris the degree of cloudiness, i c., the amount of the whole sky covered with clouds at a given moment, is determined by of the acphometer (front page), also devised by M Besson This consists of a convex glass mirror, a segment of a sphere, about twelve inches in diameter, in which

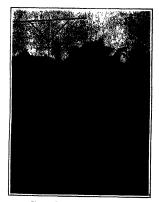


Fig. 1.—Besson's comb nephoscope. means of two cords attached to the vertical axis the ob-or turns the "comb" until the cloud appears to travel g it. A disl at the base of the axis indicates the direc-of the cloud's motion.

ten sections of equal area by means of lines engraved on the glass. As shown in our front page engraving, the meteorologist observes through an eyepiece fixed in an invariable position with respect to which latter turns freely on a vertical axis. The observer, whose own image partly obstructs sections 8.

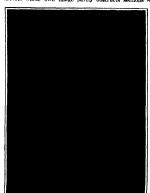


Fig. 2.—Glass plate and vertical circle



Pig. 2.—Shallow pool of water for reflecting the cloud image. MEASURING THE HEIGHT OF A CLOUD

9. and 10, notes the degree of cloudiness in the sections numbered 1 to 7. The cloudiness of each section is estimated on a neale of 0 to 10; sero meaning cloud-less, and 10 entirely overcast. He new rotates the mirror and evplace 180 degrees and observe the cloudiness in sections 7, 8, and 2, which represent the regions of the sky that at the first observation corresponds of the sky that at the first observation corresponds to sections 8, 8, and 10.

Why Not Feet Per Second?

T is a singular testimonial to the persistence of impressions and the natural conservatism of man-kind that we continue to use familiar expressions long after they have lost their original correctness of ap Thus we say "miles per hour" in estin plication. Thus we say "miles per hour" in estimating rates of speed, even in cases where only very short distances are covered. This practice has become a habit, and not a very creditable one at that. Much better would be the expression "feet per second," and this phrase would be equally understandable and far more explicit. "Miles per hour" is easily reduced to "feet, per second" by a simple formula (the multiplying of the rate of speed in miles per hour by 1.467). Conthe rate of speed in miles per hour by 1.467). Con-versely, the rate of speed in feet per second is con-verted to miles per hour by multiplying the "feet per second" agree by 0.882. Approximately, "feet per second" is one and a half times "miles per hour," and similarly "miles per hour" is about two thirds "feet per second." The following table will be found match! for anti-compartment. useful for quick comparisons:

Miles per Hour.	Feet per Second.	Feet per Second.	Miles per Hour.
1	1 47	1	. 08
2	2.93	2	1.36
3	4.40	3	2.04
4	5.87	4	2.73
5	7 33	5	3 41
6	8 80	6	4 09
7	10 27	7	4 77
8	11 73	8	5 45
9	13 20	9	6 14
10	14 67	10	6.82
20	29 33	20	13 64
80	44 00	30	20.45
40	58 67	40	27 27
50	73 33	50	34 09
60	88 00	60	40 91
70	102 67	70	47 73
80	117.33	80	54 54
90	132 00	90	61.36
100	146 67	100	68.18

Eskimo Dogs for the Market

T Grove Park, one of the suburbs of London, Mrs. Scott conducts a very interesting dog farm. assout connects a very interesting dog narm. Her specialty is Eakimo dogs, which she breeds and trains for the market. The market is not very large, but it is sufficient to make it worth her while to raise and train the best possible Eakimo dogs. It is not the food market, nor the ordinary dog market. It is the market for Eskimo dogs which are trained for Arctic exploration. If you decide to make a journey to one of the poles, you know that Eskimo dogs are absolutely essential. You can get good Eskimo dogs in Greenland, or in Alaska. But the good dogs in Greenland may not be exported except by special permission of the Junials government: and the good dogs in Alaska are not so good. One trouble with ordinary Baktimo dogs is that they have no breeding and no discipline. They will look the master with whom they have been brought up, but when they start after fish or other game, even their master can control them only by the exercise of brute force. For the purposes of your exploration you need dogs that-will obey orders given by a white man, dogs that are broken to the harness and are not afraid of work, does that have learned team work. But the good dogs in Greenland may not ork, does that have learned team work

It is this kind of dog that Mrs. Scott raises for the Her kennels have only pure blooded animals market. Her kennels have only pure blooded ann of carefully selected stock, and from earliest puppyl she trains them in how to eat and how to work. she gets through with an Eskimo dog the animal is not nearly so feroclous as one that just "growed up" in the surroundings of an Eskimo village. They adapt in the surroundings of an Bakimo village. They adapt theseaselves quickly to new masters, and they have acquired good eating manners, so that they are not so likely to attack the cuphond or fresh gibne. Mrs. Scott backs her animals no mest except penumican, and drief flash brought from Norway; a large part of the diet is a specially prepared biscutt. She has supplied trained desp for a number of Arctic and Autractic ex-tended desp for a number of Arctic and Autractic ex-

<sup>&#</sup>x27;A greatly improved form of reflecting nephoscope, based in part upon Fineman's, was introduced in 1896 by Prof. C F Marvin for the use of the U. S Weather Burcau.

How to Make an Ultra-violet Ray Objective By G. Michaud and J. F. Tristan, Costa Rica College BCAUSE ultra-violet rays are black light to our Deyes we are in ignorance of many of their proper-ties; yet there is an artificial eye, which—as Prof.

Wood has shown—can tell us much about their behavior. A mateur photographers with a scientific turn of mind (owners of a camera, who read the Scientific ECAN belong de tepe facto to that class) may contribute to the prog-ress of science, and will find considerable pleas ure in the practice of photography with ultra-violet rays. There is no need of expensive apparatus; the only sary addition to the camera is an objective trans-parent for ultra-violet rave and only for them: that is, a slivered quartz lens. This is easily made by the amateur himself, with a common spectacle pebble lens. For man reasons it is desirable that this quartz lens be of the same focus as the ordinary objective regularly used on the camera. Moreover, it should be of the periscopic type which, with the dia-phragm placed as shown in Fig. 2, will give a satisfactory definition evenly distributed all over the field. All manufacturing opticians sell spectacle pebble periscopic of any destred (Price: \$0.50 per The covering of lens.) such a lens with a thin sliver film requires the

preparation of Liebig's bath . Two grammes of pure fused silver nitrate are dissolved into 40 cubic centi-meters of water. Ammonia is added, little by little, until the precipitate formed by the first additions has disappeared. Then 90 cubic centimeters of a 3 per cent disappeared. solution of caustic soda is slowly poured into the liquid.

A black precipitate appears. It is dissolved by means of a few drops of ammonia. Water is then added until the total volume of the solution is 290 cubic centimeters. a weak solution of silver nitrate is added, drop by drop, until one last drop causes nent precipitate

The lens, which has been cleans with soap and water, then with alcohol, is laid horizontally in a glass vessel with its two extreme ends resting on two glass stoppers, the inferior face being about two inches from the bottom of the ves Nine volumes of the silver solution are rapidly mixed with one volume of a 10 per cent solution of milk sugar. The mixture is poured into the vessel until it bathes the interior face of the lens. The whole is then left for about four hours in a dark place. Then the lens is immersed ten minutes in rain water and left to dry.

e operation should be repeated for the other face. The writers found the silvering of the lens on both sides to give more complete and reliable results than a single silver film. It seems difficult to get a film totally free from capillary holes. These do not correspond on two films and the experimenter feels sure that if some visible light has been admitted it d no share in the formation of the image

With the help of a few strips of black paper the lens is glued, with its con-vex face upward, over a black paste-board tube which can be telescoped, at any time, into the objective tube of the camera, behind the shutter, in lieu the camera, behind the shutter, in neu-of the regular objective. Fig. 1 is a sec-tion of the ultra-volet ray objective thus made, and Fig. 2 shows it in place, mount-of on a Unicum shutter, in lies of the etilinear combination, the two

orly ...

A Signature

lenses of which have been unscrewed and put aside. With a lens made as stated, exposure for a land-scape in full sun at noon in June and with an aperof F/16 should last at least twenty minutes Photographs of pigments, chemicals, spectra, landscaros,

skies, microscopic objects and portraits should always



Fig. 2. - The ultra - violet ray ctive in temporary position.

Fig. 1.--Longitudinal section of

ultra - violet ray objective.

Fig. 3.-Photograph of mercuric iodide white papaverin and white paper. white papaverin and



Fig. 4.—Ultra - violet ray photograph of materials shown in Fig. 3. HOW TO MAKE AN ULTRA-VIOLET RAY OBJECTIVE

ade twice, once with the ultra-violet rays objective and once with the regular objective. Any peculiarity and once with the regular objective. Any permantal of the invisible light reflected by the object is flux easily detected. While working on these lines the writers found that while chalk, lime phosphate, arsenious oxide, starch, caffein, and verairin reflected ultraviolet light about as well as ordinary light, papa-

Auterior to the discovery of America, the existing stock of gold and silver money in the world is estimated by William Jacob, an English economist who made a very careful investigation of the subject nearly a century ago, to have been from 33,000 000 to 34,000,000 pounds sterling. In round numbers this was \$170,000,000 of our money. This amount, telative

to the subsequent production, is indicated on the chart by the small square in the crimela

In 1911, the world's production of gold was \$406,000,000. Comparing this with the world's stock of money when Colum-bus discovered America, it may be said that the gold miners of the world last year produced two and three fourths times as much gold as was represented by the world's total accumulations of agold and sliver money in 1492. To make the comparison in another way, in 1911 It took the gold miners of the world less than five months to produce an amount of gold equivalent to the world's entire stock of gold and silver money when Columbus discovered America

It will be seen from this chart that the production of gold in any considerable quantities is a modern function. The sudden increase in gold production began within the memory of many men now liv-ing. It began near the middle of the last century when placer gold was discovered in Cultfornia and Australia

When the supplies from these newly discovered placer mines began to fail, there followed a period of waning production. During this period silver was demonetized in the lending commercial countries of the world, and this demonetization, coincident with a waning gold supply, and occurring during an era rapidly expanding trade, occasioned a rapidly expanding trade, occasioned a sharp advance in the purchasing power of gold. In 1873, it required \$1.15 per bushel on an average to purchase the wheat crop of that year from the farmers of the United States, but in 1803 the same crop was bought for an average

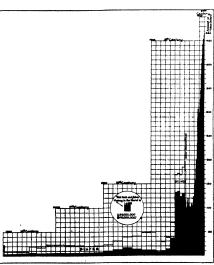


CHART OF THE WORLD'S PRODUCTION OF GOLD AND SILVER

rin, quinine sulphate, bismuth submirate, practically did not reflect ultra-violet rays. If our retina were sensitive for these rays only, such substances would appear to us as black. In spite of their white color in ordinary light. On the other hand, mercury biiodide, mercuric oxide and orpiment reflected uitra-

violet light relatively better than actinic light Figs 3 and 4 show a curious result of such differences Upon a copy of the Scientific American a layer of mercuric iodide was deposited in the middle of a concentric layer of papaverin. On the photograph made with the ordinary objective the extremely white papayerin looks, of course, whiter than the paper and the red mercurie compound darker than both. The reverse relation can be observed on the photograph made with the slivered quartz

# The World's Produc-tion of Gold

By Edward B. Howell THE accompanying ally the world's production of gold from the dicovery of America to the close of the year 1911 The horizontal divisions of the chart measure the lapse of time by ten-year periods. The ver-tical divisions represent the value of the produc tion in American money, each division representing ten million dollars The production of silver mottl its demonstration In 1873 is also shown superimposed on the gold price of 532/5 cents. From the chart it will be seen that about twenty years ago the production of gold ceased to decline and there began a phenomenal increase. It was this enormous increase in the production of gold that effectually settled the so-called "silver

During the memorable presidential campaign of 1986, the people of the United States by their voice decided against the remountration of silver, believing that such a measure would result in a cleanpening of our money and a consequent loss in its purchasing power. In 1996 the word's combined production of gold and silver (estimating the silver at its former outing value was \$405,220,000 But in 1911 the word's production of gold alone exceeded this amount

The twentieth century is not very old as yet, but

during its eleven years of gold production there has been produced in the world a greater amount of gold by over \$1,000,000 than was produced during the 350 years from the discovery of America to the discovery of gold in California. During the twentieth century gold is being produced over forty times as fast as it was during the period between 1462 and 1448.

From the discovery of America to the close of the year 1911 the production of gold in the world was something over \$14,000,000.000. This was about \$10 per capita for all the inhabitants of the globe. But of this wast amount of gold over forty per cent has been produced within the last score of years. This flood of new gold has come principally from its over as distinguished from placer deposits. Improved modes of concentration and amakamation, and above all the qualife process, making profitable the reduction of overthat formerly could not be treated, have brought abody the increase. Where this rapidly moutting column of gold production will terminate does not yet appear. If commodity prices continue to advance, it is very case tain that some gold mines will be compelled to shut down, for food, clothing and other supplies are necesarity consumed in the process of producing gold, and when gold has so declined in purchasing power that it will no longer buy the things necessary to the production, then at the point or points where this event has occurred, top production will necessarily cease.

uon, teen at the point or points where this event has occurred, its production will necessarily cease. Finally, no thinking man can avoid the conclusion that this modern increase in gold production has been a cause, probably the chief cause, of the modern rise of commodity prices. If this is true, then, instead of blauning the trusts for high prices, we should be blaming the too active gold miners of the world.

# The Nature and Origin of Life

#### Prof. Schaefer's Inaugural Address of the British Association

I N opening the discussion of any topic, a natural pronedure to follow is to start by defining one's fundamenlat owneys and terms. Thus the first passgraph of Prof. Nethedor's inaugural address become the European Vietning 'Ho. But the conduction resulted may appear to some unsatisfactory. Prof. Schaefer wisely refrain from gruing any definition. "It have the loss inclination to do so (i. e., to furmsh a definition) because recent advances in knowledge have suggested that the dividing line between animate and manimate matter is loss sharp than it has hitherto been regarded."

sharp than it has hitherto been regarded."

In the popular mund there is a tendency to associate together, as if they were inextricably linked together, if the animal tendency to the state of the stat

having given up as presidently hopeless the attempt to define life, we may next approach the seemingly cause task of describing life in terms of its most characteristic manifestations. But here also we are confronted with difficulties. The man in the attent, if he thinks about such things at all, will, in answer to our inquiry after the most characteristic property of living beings, probably mention their power of spontaneous movement. But quite apart from the fact that a large class of living forms—the higher plants—possess this power at most in very rudimentary form, recent developments of science have disclosed purely physical systems—liquid crystals and similar bothes—which marifest seemingly spontaneous motions resembling with astounding closeness those of living forms

Another property which is commonly cited as specially characteristic of living matter is its power of growth by assimilation from the surrounding medium of matter similar to its own substance. But in this respect also crystals resemble living organism, and the analogy even extends to the formation of new individuals when the "parent" has resched a certain size.

Turning from the physical phenomena of life to the chemical aspect of life processes, a similar observation must be made: the early workers in the field of organic chemisters supposed that the compounds must be misting organism, were peculiar, could be produced only under the influence of a specific "tital force," and were beyond the reach of the creative powers of the chemical laboratory. This illusion was shartered in 1823 by Wöhler's synthesis of urea, followed by immunerable further results all pointing in the same direction, and culumnating in the recent work of Pischer and others who are building up polyepitides substances of the nature of the albummonds and protects of the living organisms. There seems to be no vestige of evidence that, in order to explain the chemistry of the living body, we must invoke the aid of a specific "tital force"—we have in fact here, apparently, another case of a mere many without objective counterpart.

may in the first, apparently, and increases on a many without objective counterpart.

I many without objective counterpart view, the question naturally presents steel to our minds, whether living matter itself may not some day be preduced in the chemical laboratory: whether the chemical deforatory as whether the chemical deforation are wholly favorable, in Prof. Schader's opinion, to the ultimate realization of this, if only we are reasonable in our expectations. It is not a complicated organism which we must look for (even the lowest forms of the known to us in nature are highly complex structures), but something exceedingly elementary, to which indeed we may at first heatate to attribute "life" as ordinarily understood. It must be remembered that the earliest

forms of life on our earth were probably quite incapable of leaving any geological record behind them, as they no doubt consisted entirely of soft parts.

There is much in Prof. Schaefer's address which we

There is much in Frof. Schaefer's address which we would like to dwell on at length, but lack of space forces us to pass over with a mere mention those sections of his paper which deal with the more generally known phases of the theory of evolution. His remarks on the cellaggregate of the higher organism on cell-life and aggregate life, however, call for more lessurely consideration. "Our own life, like that of all the higher animals, is

"Our own life, like that of all the higher animals, is an aggregate life, the life of the whole is the life of the individual cells. The life of some of these cells can be put an end to, the rest may continue to live. "On the other hand, if a few cells, such as those nerve-

"On the other hand, if a few cells, such as those nervecells under the influence of which respiration is carried on, are destroyed or injured, within a minute or two the whole living machine comes to a standardil, so that to the bystander the patient is dead; even the doctor will pronounce life to be extinct. But this pronouncement is currect only in a special sense. What has happened is that, owing to the cessation of respiration, the supply of oxygon to the thesuse as cut off. And since the manifestations of life cease without this supply, the animal or patient appears to be dead. If, however, within a short period we supply the needed oxygen to the tissues requiring it, all the manifestations of life responces.

period we supply the needed oxygen to the insuser requiring it, all the manifestations of life reappear.

"It is only some cells which lose their vitality at the moment of so-called 'general death.' Many cells of the body retain their individual life under suitable eigentication observed the white our puesles of the blood to berington observed the white our puesles of the blood to beringed on the control of the body is dead. Sherrington observed the white our puesles of the blood to bemoved from the blood-vessels. A French histologies, Jolly, has found that the white corpuseles of the freg. if kept in a cool place and under suitable conditions, show at the end of a year all the ordinary manifestations of life. Carrel has succeeded in substituting entive organsobtained after death from one animal for those of another of the same species, and has thereby opened up a field of surgical treatment, the limit of which can not yet be descerned."

It is thus evident that in the higher animals the "aggregate life" is closely dependent on a proper adjustment and coordination between the "vell life" of the separate organs. Such coordination is secured by a two-fold mechanism: On the one band by nervous control, and on the other by the diffusion through the system of so-called hormones. Norvous control of body-functions may be purely refer and unconscious, or at least, outside the scope of our will, as is the case, of the control of the second of the control of the control

The influence of hormones upon bodily functions in of a somewhat different character. Hormone are internal secretions produced in various glands and poured through various channels into the general circulation. Their action is presumably of the nature of a chemical stimulus. Nervous impulses are apparently carried by propagation along nerve strands somewhat as electricity travels along a wer (though the volocity of a nerve impulse is very much smaller). Hormones, on the other hand, depend for their action on actual convection from their place of manufacture, the internal gland, to the points at which they produce their effect. Among the glands which secrete hormones are various structures whose significance remained a mystery until the function of their substances was understood. Such glands are the suprarenal capsules, secreting adreaslin (the only hormone which has so far been reproduced by synthesis in the laboratory), the pituitary body, abnormal development of which is accompanied by abnormal development of which

and several others which we can not stop to mention.

Allied in character to the action of hormones is that of antitoxines, protective substances produced by the body in reaction to an invasion by duesase germs.

body in reaction to an invasion by disease germs.
At such times the battle for our life is fought with
chemical weapons. The bacteria produce toxins, substances which poison us, while our body produces
antitoxins, unconsciously putting out poison for this
microscopic vermin, much as consciously we put out
poison for larger representatives of the parasite tribe.
The discussion of life and disease naturally leads us

The discussion of life and discase naturally leads us at last to the consideration of death. This takes place either through accident, disease, or old ago. The first two causes are more or less preventable, perhaps, when science has advanced sufficiently far, wholly so. The last is probably a cause inherent in the nature of life, and unavoidable. But, as Prof. Schnefer points out, a natural death by old sage, not hastened nor agonized by disease, should be a quiet, painless phenomenon, unattended by violent change. And if we were all certain of a quiet passing; were we sure that there would be 'no moaning at the bar when we go out to sea," we ould anticipate the coming of death after a ripe old age without apprehension.

#### A Natural African Silk

I T is proposed to make a commercial use of a native slik coming from the African region which does not appear to have been utilized heretofore. This is a slik found in the Belgian Congo region, and it is furnished by worms of the anaphe, which variety is widespread in the Uganda, the German east Africa, Cameroon and Congo as well as other regions. The African slik corporation has already begun to install plants of the kind in the Uganda and elsewhere, and two other firms are soon to begin work in Belgian Congo. are very voracious and are covered with hairs which have a stinging effect on the skin. They hardly ever change their place except during the night in order to seek food or search for good places for building their nests. They feed on plants such as Abizza fastigiata, also Bridelia micarantha and others. On the under side of this latter leaf, the anaphe lays 200 or 300 eggs placed in piles and covered with a protecting down. About two months after hatching, the worms proceed to make a combined effort in order to build a kind of nest upon the plants which furnish their food. The nest is of a siky appearance and has a color varying from coffee color to a rusty red. Of an irregular shape, the nests have a size ranging from that of an egg up to a child's head, and they contain from 10 to 100 cocoons tightly pressed together. When the butterfly is hatched, it secretes a liquid which attacks the cocoon and the envelopes of the nest, so that it can find its way to the outside. It appears that it is not required injure the silk\_of the cocoons, so that it is not required to smother the insect within the chrysalis to avoid hatching the butterfly. The nests must be handled under water in order to prevent the nettle-like action of the hairs upon the skin, such hairs and also fragments of skin being scattered through the nest. silk of the envelopes and that of the cocoons treated separately, the operation being a washing with carbonate of potash solution until no more color is dis-charged, then the silk is dried in the air and packages of it are sent to the factories. The yield in the present case is estimated at 1 pound of silk thread coming from 6 pounds of raw silk. It does not seem difficult to carry on silk raising in this case, as the matter of acclimating the silk worm, which is such an important one with the usual kind. does not need to be dealt with here, either for the ipsect nor for the food plants. No diseases attack the insects, as far as can be noticed.

#### Corresuondence

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[The editors are not responsible for statements no the correspondence column. Anonymous commun in the correspondence column. Anonymous communica-tions cannot be considered, but the names of correspondents

#### The Mississippi River

To the Editor of the SCIENTIFIC AMERICAN:

Noting your editorial of May 25th, page 475, we would be to present the following solution of the Mississippi like to pr

Construct a ship canal as follows

Leave the east bank of the Mississippi River at some point between Memphis and Cairo.

Parallel the river southward until the highlands east of Memphis are passed.

n follow the general direction of the contour lines

toward the southeast. toward the southeast.

Continue through the level plains of Mississippi and southern Alabama into Georgia, dropping gradually through the contour lines toward the Gulf of Mexico.

When a point north of the Florida peninsula is reached.

turn slightly to the southward and cross all the peninsular contour lines near their centers or highest points.

Dredge the Alabama River and other streams of importance crossed by this proposed route of ship canal. Place looks and spillways, at the points where import-ant streams cross the ship canal, so as to regulate water levels and facilitate commerce.

ADVANTAGES TO BE GAINED.

- 1. Relief to the congested lower Mississippi River at 2. Regulation of the Mississippi River flow at all high-
- vater periods.

  3. The creation of an inland system of waterways which will become equal in importance to the Mississippi
- 4. A limited supply of water for irrigation where needed along the upper portion of the canal.
  5. An unlimited supply of flood water for irrigation throughout the ontire Florida pennsula in the season of

6. Silt and clay sediments to balance the sandy wal of Florida in the fields and on the country roads. 7. Fertilizer where it is most needed.

J. L. GOULD George M. Lummis Fort Myers, Fla.

## America and the Gordon Bennett Cup

To the Editor of the Scientific American :

The question asked in your editorial of September 14th, as to the reasons for the exceedingly poor showing made by America in the Gordon Bennett Cup race suggests several collateral questions.

Is not the greatest difference between American machines and French ones almost entirely a difference in the degree of perfection of details of the machine?

- Is not this difference almost entirely due to the characteristic of the French engineers and machiners manufacturers of taking infinite pains, even with the most minute details?
- Is this due to a difference in temperament, or to the difference in the keepness of competition to which engineers and manufacturers are in general subject in the two countries, or to the difference in thor oughness of the superintendents actually in charge of the workshops, or to the fact that the lower cost of skilled labor in France makes it possible to give to the actual work of construction an amount of time that would be prohibitory in this country?
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New York city. CHARLES M. MANLEY

#### Laces and Flour from Bananas

To the Editor of the SCIENTIFIC AMERICAN I am an old subscriber of the SCIENTIFIC AMERICAN.

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In the issue of February 17th, 1912, page 151, under the heading "Banana Cloths," is said: "It has been left to the Chinese to teach us how the tons of banana fiber thrown on the rubbish heap every year can be converted into banana cloth and sold at a most remunerative into banana ciota and sold at a most remunerative price." I take the liberty of giving to you the knowledge that long before the Chinese the Brazilians had utilized the fiber of banana trees for cloth and ladies' garments. I inclose a sample of lese that is sold here for one milreis a meter, which corresponds to about 12 cents a foot in

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s, which like the banana cloth, has been on our markets in Brazil over twenty years.

Though you will not be responsible for statements made in the correspondence columns of your journal, I think I must call your attention to the facts above mentioned in favor of our national industry here.

Para, Brazil Francisco Bolonha, C.E.

#### The Steel Rail Problem

To the Editor of the SCIENTIFIC AMERICAN:

I have read your editorial in the issue of August 24th with a great deal of interest, and some surprise. I have been a reader of the SCIENTIFIC AMERICAN for a great many years, and have always found its edi-torials fair in every way, but in this case I think you are not treating the steel makers fairly when you place all the blame for defective and unsafe rails upon them, when the fact is that the railroads themselves are the ones to blame because they insist in their specific: tions upon such hard steel, steel which will pipe, and which the most careful examination will not detect A diseard or cutting off of 50 per cent of the ingot or bloom would not be sure to discover all of the piping It is impossible to detect the last tracing of piping by cutting the bloom when it is hot It could only be done by nicking and breaking cold This, of course, is impossible in the regular manufacture of rails.

I am not a rail maker or connected with any works making rails, but for over forty years I have been connected in different capacities with the manufacture of open hearth and Bessemer steel in this country, and, therefore, feel that I ought to know something

Ever since the manufacture of melted steel was begun by Huntsman in Sheffield, more than one hun-dred years ago, one of the greatest expenses of the process of making high carbon steel has been caused by the piping and the waste occasioned by the steel makers being obliged to top the ingots, that is break them cold until every trace of the pipe is removed. In many cases over one half of the input is removed before this has all disappeared. This seems to be as much of a problem with the tool steel maker to-day as it was forty years ago, and this trouble is had with ingots of very small section; most of them 4 to 6 inches The piping increase s with the size of the ingot. which in most rail mills to-day are from 18 inches to 22 inches square.
You say the steel makers are to manufacture

kind of steel that suits their particular whim. It is many years since they have been allowed to do this. Detailed specifications as to every detail of the manufacture are made, and the inspectors watch day and night to see that the specifications are carried out to the letter, in many cases almost taking the manufac-ture out of the steel makers' hands.

You say in your article that it is well understood by engineers that it is possible to produce a rail that will stand up under very high speed fraile, and that the failure to produce them is entirely due to the rail makers themselves

would like to see proof that this is well understood by engineers. You will, I think, find that the general opinion of engineers is that the rails are made strictly to the railroad's own specifications, and that,

therefore, the fault lies with them

Now the question is, what is the remedy for all this trouble? The answer is very simple, make steel that is low in carbon and phosphorus that will pipe very little if at all. This can be done, but if this is proposed the rational men immediately say that they will have a rail that will not wear well, they will wear out in a very short time, so they insist on having a hard and consequently brittle rail, and take the risk of broken rails, costly wrecks and the killing of pas-

Much is being learned lately about alloyed steels. and we now know that there are other hardeners that can be used besides carbon that do not cause piping, but these will increase the cost of the steel somewhat, which the ratiroad companies would probably object First cost seems to be all that the average purchasing agent thinks of

So it bolls down to this-the railroad company in order to save money in renewals insist that the steel maker give them rails that they (the steel makers) know are brittle and unsafe to use, saying in effect "That's none of your business, we will take the risk," and they do, and they and the traveling public pay

You do not seem to think that the present schedules of the fastest railroad trains are too fast for safety In this you do not agree with many of the best railroad men in this country. I feel sure they have more than reached the safe limit, and many a railroad man will breathe easier and thank God when such trains as the 18-hour fliers between New York and Chicago are cut down to speed, as they ought to be at once speak with a great deal of feeling on this subject because the craze for high speed a railroading has cost me the lives of a dearly beloved brother and two others of the leading men of a large manufacturing concern with which I am connected

S. T. WELLMAN

#### Gyroscopic Action of Revolving Aeroplane Motors

To the Editor of the SCIENZIFIC AMERICAN

Less than two hours before the accident that killed Paul Peck I had a talk with him on the subject of the danger in gyroscopic force. He admitted that at times force had caused him considerable trouble, but said that he did not believe it to be particularly dangerous I explained to him several conditions that would excite gyroscopic force in his motor to a point where it become highly dangerous, and told him that should be ever meet one of these conditions be would be at once convinced that I had not over-estimated the peril, but that he would then be in the same flx as other fellows that have gone before-not able to about it! The newspaper accounts of the accident say "No one but Paul Peck could tell exactly what ed the accident "

I had just examined Peck's new machine and told thin that he would have to be extremely cautious in the use of his controls as it, in my opinion, would be highly susceptible to the elevator and would rock lightly about its lateral axis. You will notice by the newspaper accounts that after his first flight he spoke particularly about this very feature, and it was no doubt one of these sudden dips that excited gyroscopic force and caused the spiral movement in his machine I found three eye witnesses, not one of whom was an aviator, who distinctly saw Peck turn his controls contrary to his path of flight, but in all the accounts of the accident, given out by the aviators, not one of them mentioned the fact that the machine splinled with its rudder turned to the outside of the encle and pitched downward with its elevator raised to the limit Nor did any one think it worth while to mention that during all this time the motor was spinning at top speed; yet these three features of the accident, completely ignored in all published accounts, show the real cause and prove the brutal strength of this force when once it is set in motion.

Peck said that while he did not believe there could be any great danger from gyroscopic force, he was open to conviction and asked me to bring out to him on the following afternoon a copy of my new on the subject. I was there with the copy at the appointed hour, but too late to save the poor fellow How much longer are they going to fight against the

they will understand? hicago, Ili THOMAS PRESTON BROOKE

How many more lives must be sacrificed before

price of 53 2/5 cents. From the chart it will be seen that about twenty years ago the production of gold coased to decline and there began a phenomenal increase. It was this enormous increase in the production of gold that effectually settled the so-called "silver onestion".

During the memorable presidential campaign of 1896, the people of the United States by their votes decided against the remonetization of silver, believing that such a measure would result in a cheepening of our money and a consequent loss in its purchasing power. In 1896 the world's combined production of gold and silver (estimating the silver at its former colling value; was \$460,329,000 But in 1011 the world's production of gold nione exceeded this amount to over \$600,000.00

The twentieth century is not very old as yet, but

during lise eleven years of gold production there has been produced in the world a greater amount of gold by over \$1,000,000,000 than was produced during the 360 years from the discovery of America to the discovery of gold in California. During the twentieth century gold is being produced over forty times as fast as it was during the period between 1462 and 1840.

From the discovery of America to the close of the poer 1911 the production of gold in the would was something over #81,000,000,000. This was about \$10 per capits for real the lumbations of the globe. But of this vast amount of gold over forty per cent has been produced within the last score of years. This food of new gold has come principally from its ores as distinguished from placer deposits. Improved modes of concentration and analignmenton, and above all the cyanide process, making profusible the reduction of ores

that formerly could not be treated, have brought about the increase. Where this rapidly mounting column gold production will terminate does not yet appear. If commodity prices continue to advance, it is very catan that some gold mines will be compelled to shut down, for food, clothing and other supplies are necessarily consumed in the process of producing gold, and when gold has so declined in purchasing power that it will no longer buy the things necessary to the production, then at the point or points where this event has occurred, its production will necessarily coase.

Finally, no thinking man can avoid the conclusion that this modern increase in gold production has been a cause, probably the chief cause, of the modern rise of commodity prices. If this is true, then, instead of blaming the trusts for high prices, we should be blaming the total cutter gold miners of the world.

# The Nature and Origin of Life

#### Prof. Schaefer's Inaugural Address of the British Association

I N opening the discussion of any topic, a natural proordure to follow is to start by defining one's fundamental concepts and terms. Thus the first paragraph of
Prof. Schaefer's inaugural address before the British
Association at Dundee is devoted to the problem of
"idefining" life. But the conclusion reached may appear
to some unsatisfactory Prof. Schaefer wisky refrains
from giving any definition "I have the less inclination
to do so (i. e., to furnish a definition) because recent
advances in knowledge have suggested that the dividing
line between animate and inanimate matter is less
sharp than it has hitherto been regarded."

sharp than it has interest over regarder.

In the popular mind there is a tendency to associate together, as if they were inextricably linked together, as if they were inextricably linked together, as if they were inestricable with a serious of the substances. This finds expression in such terms as "animate" and "inamimate," which are commonly used practically as ynonoryms for "living," and "liftcless," respectively. But there is no setuntial warrant for this point of view, and the problems considered by Prof. Schaefer are essentially problems of matter, not problems relating to the "coul" (anima).

Having given up as practically hopeless the attempt to define life, we may next approach the seemingly easier task of describing life in terms of its most characteristic manifestations. But here also we are confronted with difficulties. The man in the street, if he thinks about such things at all, will, in answer to our miquity after the most characteristic property of living beings, probably mention their power of spontaneous movement But quite apart from the fact that a large class of living forms—the higher plants—possess this power at most never rudinary form, recent developments of seience have disaclosed purely physical systems—liquid crystals and similar bodies—which manifest seemingly spontaneous motions resembling with astounding closeness those of living forms.

Another property which is commonly cited as specially characteristic of living matter is its power of growth by assimilation from the surrounding medium of matter similar to its own substance. But in this respect also growth of the companies of

Turnug from the physical phenomena of life to the chonical spect of life processor, a similar observation must be made: the early workers in the field of organism the beauty to be consisted and the compounds must be the supposed that the compounds must be with in the hung organism were peculiar, could be produced only under the influence of a specific "with Grore," and were beyond the reach of the creative powers of the chemical laboratory. This illusion was shattered in 1828 by Wohler's synthesis of uras, followed by innumerical the control of the creative and continuous and enhimating in the recent work of Flieber and others who are building up polypeptides—mistances of the nature of the albuminoids and protects of the lying organism. There seems to be no vestige of evidence that, in order to explain the elementry of this hying body, we must invoke the aid of a specific "vital force"—we have in fact here, apparently, another case of a more name without objective counterpart.

Having reached this point of view, the question naturally presents itself to our minds, whether hving matter itself may not some day be produced in the chemical laboratory—whether the chemis is dottined some day to 'creatio' a hving thing. Indications are wholly favorable, in Prof. Schaefin's opinion, to the ultimate realization of this, if only we are reasonable in our expectations. It is not a complicated organism which we must look for foven the lowest forms of life known to us in nature are highly complex structures), the tendency to the think indeed we may at first hesitate to attribute "life" as ordinarily understood. It must be remembered that the earliest

forms of life on our earth were probably quite incapable of leaving any geological record behind them, as they no doubt consisted enturely of soft parts. There is much in Prof. Schaefer's address which we

There is much in Prof. Schaafor's address which we would like to dwell on at length, but lack of space forces us to pass over with a mere mention those sections of his paper which deal with the more generally known phases of the theory of evolution. Has remarks on the cell-aggregate of the higher organism on cell-life and aggregate life, however, call for more issuarely consideration. "Our own life, like that of all the higher animals, is

"Our own life, like that of all the higher animals, is an aggregate life; the life of the whole is the life of the individual cells. The life of some of these cells can be put an end to, the rest may continue to live.

"On the other hand, if a few cells, such as those nervecells under the influence of which respiration is carried on, are destroyed or injured, within a munute or two the whole living machine comes to a standstill, so that to the hystander the patient is dead; even the doutor will pronounce life to be extinct. But this pronouncement is correct only in a specual sense. What has happened is that, owing to the cessation of respiration, the supply of oxygen to the tissues as cut off. And since the manifestations of life occase without this supply, the animal or patient appears to be dead. If, however, within a shortpared we supply the needed oxygen to the tissues requiring it, all the needed oxygen to the tissues requi-

ing it, all the manufestations of life responer. "It is only some cells which lose their vitality at the moment of so-called 'general death'. Many cells of the body retain their individual life under suitable circumstances long after the rest of the body is dead. Sherington observed the white corpusels of the blood to be active when kept in a suitable intrinest fluid weeks after removal from the blood-vessels. A French histologies, Jolly, has found that the white corpusels of the frog, if kept in a woil place and under suitable conditions, show at the end of a year all the ordinary manufestations of life. Carrel has succeeded in substituting entire organization of the same species, and has thereby opconed up a field of the same species, and has thereby opconed up a field of the same species, and has thereby opconed up a field of the same species, and the streety of which can not yet be

usecular thus evident that in the higher animals the "agrogate life" is desired spendent on a propre adjustment and coordination between the "sell life" of the separate organs. Such coordination is secured by a two-fold mechanism. On the one hand by nervous control, and on the other by the diffusion through the system of so-called hormoness. Nervous control of body-functions may be purely reflex and unconscious, or at least, outside the scope of our will, as is the case, for instance, with heart action in normal individuals. Or it may be more or less directly governed by our will and emotions.

The influence of hormones upon bodily functions of a somewhat different character. Hormones are internal secretions produced in various glands and poured through various channels into the general circulation. Their action is presumably of the nature of a chemical stimulus. Nervous impulses are apparently carried by propagation along a view (though the velocity of a nerve impulse is very much smaller). Hormones, on the other hand, depend for their action on actual convection from their place of manufacture, the internal gland, to the points at which they produce their effect. Among the glands which secrete hormones are various structures whose significance romained a mystery until the function of their substances was are various structures whose significance romained a mystery until the function of their substances was necessarily advantaged to the point of the produced by action of the produced place of the produced by action of the produced by action of the produced by a charmal development of which has so far been reproduced by subnormal development of which is accompanied by abnormal development of which is accompanied by abnormal development of which

and several others which we can not stop to mention.

Allied in character to the action of hormones is that of antitoxines, protective substances produced by the body in reaction to an invasion by disease germs.

At such times the battle for our life is fought with chemical weapons. The bacteria produce toxins, substances which poison us, while our body produces antitoxins, unconsciously putting out poison for this microscopic vermin, much as consciously we put out poison for larger representatives of the parasite tribe.

microscopie vermin, much as consciously we put out poison for larger representatives of the parasite tribe. The discussion of life and disease naturally leads us at last to the consideration of death. This takes place either through accident, disease, or old ago. The first two causes are more or less preventable, perhaps, when science has advanced sufficiently far, wholly so. The first two causes are more or less preventable, perhaps, when science has advanced sufficiently far, wholly so. The first two causes are natural death by of dage, not hatetened nor agonized by disease, should be a quiet, painless phenomenon, matural death by oldest change. And if we were all certain of a quiet passing; were we sure that there would be "no meaning at the bar when we go out to sea," we could anticipate the coming of death after a ripe old age without apprehension.

#### A Natural African Silk

ed to make a commercial use of a native I is proposed to make a commercial use of a native slik coming from the African region which does not appear to have been utilized heretofore. This is a slik found in the Belgian Congo region, and it is furnished by worms of the anaphe, which variety is widespread in the Uganda, the German east Africa, Cameroon and in the rigantia, the German east Africa, Cameroon and Congo as well as other regions. The African slik corporation has already begun to install plants of the kind in the Uganda and elsewhere, and two other firms are soon to begin work in Belgian Congo. The worms are very voracious and are covered with hairs which have a stinging effect on the skin. They hardly ever change their place except during the night in order to seek food or search for good places for building th They feed on plants such as Abizza fastigiata, also Bridelia micarantha and others. On the under side of this latter leaf, the anaphe lays 200 or 300 esses placed in piles and covered with a protecting de About two months after batching, the to make a combined effort in order to build a kind of nest upon the plants which furnish their food. nest is of a silky appearance and has a color varying from coffee color to a rusty red. Of an irregular shape, sts have a size ranging from that of an egg up to a child's head, and they contain from 10 to 100 cocoons tightly pressed together. When the butterfly is hatched, it secretes a liquid which attacks the cocoon and the envelopes of the nest, so that it can find its way to the outside. It appears that this does not injure the silk of the occoons, so that it is not required to smother the insect within the chrysalis to avoid hatching the butterfly. The nests must be handled under water in order to prevent the nettle-like action of the hairs upon the skin, such hairs and also fragments of skin being scattered through the nest. The silk of the envelopes and that of the cocoons are treated separately, the operation being a washing with arbonate of potash solution until no more color is dis-parged, then the silk is dried in the air and packages of it are sent to the factories. The yield in the present case is estimated at 1 pound of silk thread coming from 6 pounds of raw slik. It does not seem difficult to carry on silk raising in this case, as the matter of to carry on sut raising in this case, as the matter or acclimating the silk worm, which is such an important one with the usual kind, does not need to be dealt with here, either for the insects nor for the food plants. No diseases attack the insects, as far as can be noticed.

#### **SCIENTIFIC AMERICAN**

## Correspondence

[The editors are not responsible for statements made the correspondence column. Anonymous communica-ns cannot be considered, but the names of correspondents will be withheld when so desired.

#### The Mississippi River

To the Editor of the SCIENTIFIC AMERICAN:

Noting your editorial of May 25th, page 475, we would like to present the following solution of the Mississippi

Construct a ship canal as follows:

26, 1912

Leave the east bank of the Mississippi River at some point between Memphis and Cairo

Parallel the river southward until the highlands east of

n follow the general direction of the contour lines toward the southeast.

Continue through the level plains of Mississippi and southern Alabama into Georgia, dropping gradually through the contour lines toward the Gulf of Mexico.

n a point north of the Florida peninsula is reached, turn alightly to the southward and cross all the peninsular contour lines near their centers or highest points. Dredge the Alabama River and other streams of im-

ortance crossed by this proposed route of ship canal.

Place locks and spillways, at the points where import-

ant streams cross the ship canal, so as to regulate water levels and facilitate commerce.

- ADVANTAGES TO BE GAINED 1. Relief to the congested lower Mississippi River at flood time.
- 2. Regulation of the Mississippi River flow at all highwater periods.
- 3. The creation of an inland system of waterways which will become equal in importance to the Mississippi River.
- A limited supply of water for irrigation where
- needed along the upper portion of the canal.

  5. An unlimited supply of flood water for irrigation throughout the entire Florida pennsula in the season of
- 6. Silt and clay sediments to balance the sandy soil of Fiorida in the fields and on the country roads.
- 7. Fertilizer where it is most needed.

J. L. Goven Fort Myers, Fla. GEORGE M. LUMMIS

## America and the Gordon Bennett Cup

To the Editor of the Scientific American

The question asked in your editorial of September 14th, as to the reasons for the exceedingly poor show-ing made by America in the Gordon Bennett Cup race suggests several colleteral anestions

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To the Editor of the Sciengific American

Less than two hours before the accident that killed Paul Peck I had a talk with him on the subject of the danger in gyroscopic force. He admitted that at times this force had caused him considerable trouble, but said that he did not believe it to be particularly danger I explained to him several conditions that would excite gyroscopic force in his motor to a point where it would become highly dangerous, and told him that should be ever meet one of these conditions be would be at once convinced that I had not over-estimated the peril, but that he would then be in the same fix as the other fellows that have gone before not able to tell about it! The newspaper accounts of the accident say "No one but Paul Peck could tell exactly what caused the accident "

I had just examined Peck's new machine and told him that he would have to be extremely cautious in the use of his controls as it, in my opinion, would be highly susceptible to the elevator and would rock lightly about its lateral axis. You will notice by the newspaper accounts that after his first flight he spoke particularly about this very feature, and it was no doubt one of these sudden dips that excited gyroscopic force and caused the spiral movement in his machine I found three eye witnesses, not one of whom was an aviator, who distinctly saw Peck turn his controls contrary to his path of flight, but in all the accounts of the accident, given out by the aviators, not one of them mentioned the fact that the machine spiraled with its rudder turned to the outside of the circle and Nor did any one think it worth while to mention that during all this time the motor was spinning at top speed; yet these three features of the accident, com-pletely ignored in all published accounts, show the real cause and prove the brutal strength of this force when once it is set in motion

Peck said that while he did not believe there could be any great danger from gyroscopic force, he was open to conviction and asked me to bring out to him on the following afternoon a copy of my new article on the subject. I was there with the copy at the apduted hour, but too late to save the po or fellow

How much longer are they going to fight against the truth? How many more lives must be sacrificed before they will understand?

Chicago, Ill. THUMAS PRISTON BROOKE

## Professor Dr. Paul Walden

## By Dr. George F. Kunz

LEROI est mort, vive le Roi! Now that the Eighth International Congress of Applied Chemistry has come to a close our thought naturally turn in antispation to the next, the Ninth Congress and its recently appointed preedent; for, upon the retiring of Dr. Nichols from this office, it became incumbent upon the Congress to clear now precident in his place.

Niehola from this office, it became menumbent upon the Congress to clear a now president in his place. The man upon whom this choice has fallen is Prof. It Paul Walden, a Russam by birth, and director of Polyrechneum at Rugs. The present events a fit cosmon briefly to review the life of the chemist who may be present the present extension from the Ninth International Congress which is to assemble in 1915 at Nt. Petersburg, Russia, Paul Walden was born near Rigs on July 27th, 1883.

Paul Walden was born near Rigs on July 27th, 1863. He received his early schooling at the Realschile in Rigs and thereupon entered the Polytechnicum, where his most brillant pupis. In 1885 he was appointed assistant in the Department of Physics and was transferred in 1888 to the Department of Chemistry. He received his appointment as Professor of Analytical and Physical Chemistry in 1894 and was raised to a full professorship in 1896, being at the same time appointed director of the Polytechnicum. This is the office which he holds at the present time.

1rof. Walden has been a most profife worker in the

Irof. Waidon has been a most prolife worker in the hold of chemnity and physical chemistry. A list of his publications would fill several columns of these pages. Among the subjects to which he has given his very special attention may be mentioned particularly steroolemistry and the closely allied subject of optical activity. Those of our readors who perused the burnly of the great van 't Hoff in our pages one months ago, will remember that stereochemistry, which may be said to owe its burth to van 't Hoff, is that department of the scenere which deals with the representation of chemical substances by means of three-dimensional formula or, to use the words of the title of one of van Hoff's own publications, with the arrangement of the atoms in space. Vain 't Hoff, too, it was who pointed out that optical activity is colosely related to the stereochemical properties of the compounds which display this property of turning the plane of polarization of light traversing them. A great mass of experimental data on this subject has some been collected by many workers in the field, among which must be mentioned seath mass & Walden, Landoldt, Frankland,

and others
Apart from his more strictly scientificrescarch work, Walden has also contributed a number of very excellent biographical sketches of great chemists. Of these perhaps the most valuable of all is he life of Ostwald, of which Ostwald himself is reported to have said that he owed fifty per cent of his reputation to this bio-

The high attauments of Prof. Walden and the remarkable work performed by him have been officially resognized by the bestowal upon him of many orders and other honors. Prof Walden speaks fluently the Russuan, Livonian, French and German languages and has considerable familiarity with English and Italian also. He is a fluorit and ready speaker and his dolivery is dignified and impressive. He speak directly to the point, with carrefully chosen words by which he knows to attract and mantain the close attention of his audience. His expression is invariably clear and leaves no doubt as to his meaning. As is commonly the case, clear thinking in him finds corresponding expression in his words, which accordingly carre conviction to the minds of his

Prof. Walden is in many respects peculiarly adapted to function as presiding other to the Ninth Congress of Applied Chemistri When we consider the complex compastion of the body which will assemble, made up as it is of as many, or perhaps more, countries than there are chemical elements, well may we say that no one is better qualified than Prof. Walden, with his intimate knowledge of the art of combining and arrangement to various chemical elements, to blend into one homogeneous whole the imany heterisgeneous components which will be united at the noxt Congress. Many important subjects will have to be considered, among them whether the annual reports of the International Commission of atomic weights shall be used solely for sensitific purpose, or shall be made the basis of technical determinations. The Con-



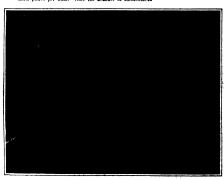


gress is to determine on some general rule which shall be followed universally, thus doing away with a great deal of unnecessary confusion. The Eighth Congress recommended the adoption of standard methods of examination of ores, metals and fuels; the Ninth will have to decide on the acceptance of the pro-



The first motor-driven freight and passenger ship to arrive at New York.

Twin motors of 2.500 combined horse-power drove this ship from Hamburg to Havana,
4027 miles, at a speed of 11.1 knots and with a consumption of 0.84 pound of oil per
horse-power per hour. Note the absence of smokestacks.



The twin motors of the "Christian X." each of 1,250 horne-power.

A steam plant would reduce the cargo capacity of this ship by 30 per cent. The mediag due to the oil motors in \$18,000 every 100 days.

ject for an International Center of Congresses with menent headquarters at the Hague, the proper selection of International delegates, the best arrangement of the proper to be read, and many other Doints.

or antermenonia companee, no near arrangement of the papers to be read, and many other points. It is due in no small measure to the splendid leadership of the retired president, Dr. William H. Nichola, that the recent Congress proved such a complete success and closedwith absolute harmony; and we have every cause to be optimistic in our expectations with regard to the equally successful course of the impending Ninth Congress.

Ninth Congress.

The honomary president of the Ninth Congress will be Prof. Dr. Demetri Kamovaloff, the nestor of Russian chemists and Professor Emeritus of the University of St. Petersburg. Russia.

#### A 10,000-ton Motor-driven Ship

THE arrival of the "Christian X," the first large of consequence, motor-driven ship, at New York man another important step in the development of teasa-atlantic travel, as advancement of greater dentificance than any that has been made since a steamilip first crossed the Western Ossan. Had the "Christian X" been a smaller ship of the second of the order by motors and the western than the second of the proposition of the second of th

development; see accessor, overcome any within sight.

The "Christian X," which was built by Burmelster & Wain, I.d.d., of Copsehagen, and is owned by the Hamburg-American. Company, is a freight and passenger vessel, whose length is 370 feet, beam 53 feet, and maximum draft 24 feet, at which her displacement is 10,200 tons, and her dead weight carrying capacity 5,000 tons. She is driven by twin Diesel engines of a combined maximum indicated horse-power of 2,000.

Rach engine contains eight cylinders, 2014 inches in

Each engine contains eight cylinders, 201/4 inches in diameter, and 23½ inches stroke. In each cylinder head are four valves, respectively for the air admission, that admission, the exhaust, and for starting by compressed air. The charge is ignited, on the well-known Diesel restem, by the heat of compression. The air

being compressed to 475 pounds and corresponding temperature of 850 der. Cent. In starting the engines, compressed air is drawn for the purpose from two reservoirs at a pressure of 300 pounds to the equare inch. The compressed air is utilized for the first three or four strokes, when the air supply is out out and the oil supply ent in.

There are two auxiliary engines, one on the outboard side of each main engine. Each is a four-eylinder, Diesel motor of 250 horse-power and each is connected to a dynamo for furnishing elettre light and power, and to a four-stage air compressor, which is used for supplying ar at 300 pounds to the two reservoirs used in statige the main engines. The sir for stomising the main engines. The sir for stomising the coll is further compressed to 900

pounds to the square inch.

The main engines are controlled from the starting platform by means of a lever and a wheel, the first regulating the oil supply, the second the reversing. The reversing gear and the general mechanism for operation of the valves are among the most successful features of the design. We are informed by the chief engineer that, during the tests, with the engines running full speed absend, the port engine was changed to full speed astern in 10 seconds' time, a remarkable result in an engine of 1,200 hores-power.

augme of 1,200 horse-power.

That the first Atlantic crossing by a motor-driven ship of large size has been schewed with perfect success is shown by the following facts: The "Christiani X." with a full load aboard, left Hamburg July 23rd, and reached Havana August 9th, having covered 4,627 miles, without a stop, at an average speed of 11.1 knote. The chief engineer informs us that the weather was desidedly hed from the 28th of July to the 5th of August, with winds of from 7 to 8 strength, and a sea which caused the ship to pitch and roll heavily and take much water on deek. The propellers were frequently out of the water, but the Aspinall regulator, which sate directly on the oil feed, gave excession results, as may be judged from the fact.

(Concluded on page MR.)

# The Discovery of a New People

#### Stefansson's Blond Eskimo of Victoria Land

As late as 1906 Victoria Land, a large island that juts out into the Arctic Ocean, north of Canada, was supposed to be uninhabited. Of the mainland to the south nothing

was known. The coast between Victoria mainland had been skirted by water no less than four times in the twenties of the last century by Dr. Richard-son; in the for-ties; in the fifties by Capt. Collinson, and by Amundsen in 1905 during his Northwest Pasage expedition. here of these four exploration trips saw little of the land, and because they met no Eskimo on the ice, geographers and othnologists had the belief that the entire coun-try east of Cape Parry to Corona-tion Gulf was uninhabited. The western or Bail-lie Island Eskimo trated farther east than Cape Lyon, and knew nothing definite about any tribes beyond Cape Lyon. Indeed, they regarded the entire country to the east as unin-habitable for lack of food.

Stefansson Seises a Brilliant Op-

portunity.

Ilere was a
terro incognita worth a careful scientific survey. Even though it uninhabited, its geology, its fauna and flora were well worth study. Mr. V. American Museum of Natural History decided to explore the country. With country. With the financial aid of the Museum and of the Geothe Canadian government, hé or-ganized an expedition. Associated with him was Dr. R. M. Anderson, a biologist of note. In 1908 the Stefans-son-Anderson expedition left New Lork Proceed

Marie Land Comment

and eventually reached Herschel Island at its mouth There they expected to pick up supplies For the first

time in twenty years ships found it impossible to pene trate the summer ice to the east of Point Barrow was impossible to proceed at once

A red-bearded blue-eyed Eskimo. Stefansson discovered a tribe of forty European-like Eskimo north of Cape Bexley.

Eskimo helping Mr. Stefansson break camp and pack the sleds for the journey. Among the one thousand Eskimo of Victoria Land are some who have blue eyes and blood hair. The type is so markedly European that it will be a matter of considerable interest and import ance to detruine whether or not it is the result of an admixture of Scandinavian blood.



Itinerary of the Stefansson-Anderson Arctic expedition. April, 1910, Mr. Richasson and Dr. Andronn olic Cape Dynon, the most entited by the Mackenie River Estimo. The region to the east of Cape Live a supposed to be unlambified, for the costs that does aftered by writer in supposed to be unlambified, for the costs that does aftered by writer in supposed to be unlambified, for the costs that does not refer to the result of the supposed of the cost of the supposed to the supposed to



V. Stefansson. The results of his expedition were extra ordinary. We have covered the last intle geographically that we set out to cover, says Mr. Stefansson, and have found what we set out to find—a new people, less continuousled, more numer-ous than any one thought possible.



Eskims snow house with a tent-like roof of furs.

ut of Dolphin and Union Strait was inhabited by Rakimo in former times, but now the most westerly group is the Akuliskat L mear Cage Bezier, discovered by Mr. Rhefmason. The camp sites of this tribe are found on every hilliop cast of the Copier Until they were visited by Mr. Bretanson these Eskimo had never seen a white man.

Stefansson had to journey to Point Barrow, in order to obtain matches, tobacco, tea, and other necessities for a protracted stay in an un-known country Although a whole year was thus lost (the distance between Herschel Island and Point Barrow is hun-dreds of miles) the diversion was not unprofitable.
The region about
the mouth of the Colville River is scientifically a lmost virgin field for the geologist and biologist Accordingly, Dr Anderson and Mr Stefansson im-proved the opportunity to make a study of the

country
The expedition began the work that it set out to accomplish in 1910. On April 27th of that year, Mr Stefansson with three Eskim o companions started east from Cape Lyon —the most east-eily point at started which Eskimo houses were seen by Dr Richardn on his Frank lin search expe dition, and the most easterly point known to by Alaskan Eskimo That the the explorers went was not always uninhabited was proved by the ruins of villages, abandoned by Eskimo not more than half a century ago, and that the tribes who had once lages engaged in whaling was in turn proved by the bleached vertebrae of whales strewn about.

The Discovery of a New People. and his compan ions journeved further east the evidences of more recent occupation of the territory became stronger At Point Wise freshly cut wood

# Farm Electric Lighting by Wind Power

## A Complete Lighting Plant Installed for \$250

By Putnam A. Bates, E.E.

Introduce of country as I have in connection with my engineering work for the past aftern years, I have encountered many interesting insulations where electricity plays the important role.

The importance, however, is not always measured by the size of the installation, and as an illustration of this is the wind power electric plant on Mr. J. F. Forest's farm at Poynette, Wisconstu. This ingenious, tu unpretentious equipment, this farmer installed hinself. He set up the mill and erected the dynamo, storage battery and shortfug. In free, he did all the wiring throughout his entire group of buildings at a cost that did not exceed \$2.56, including image, switches, buttery

ceils, insulators, wire, dynamo, wholm?!
—everything. This I call a real achievement and an evidence of the simplicity of electrical apparatus. Locarded as it is in a farming community about twenty-five uniter from Madison, Wisconsin, this farm is no different from many in that district. The property comprises a tract of some bundred or more acres, and the "routine" is about the same as elsewhere on thousands of fatins. Mr. Porest, however, is unusual—the has

Mr. Forest, however, is unusual—be has the gift of imagination which enables one to see things completed before they are begin. He was watching one day an old windmill pumping water on his placy, and without understanding much about electricity, he made up his mind that if revealing the "armature" of a dynamo "ande" electricity, this mysterious force could be produced on the farm by wind power just as it is in factories and city establishments where steam or gas engines are utilized, to furnish the initial energy.

No this farmer set about his task with a will, and the accompanying photographs show that he accomplished what he set out to do

While there are other wind power electric plants, and Mr. Forest cannot claim the distinction of having the first anchinstallation, like has been marked with success. And this example may well be followed by many other farmers who can appreciate the advantage of legitimate improvement. A brief description will, therefore, be of interest to those who may be contemplating a venture in this direc-

The power windmill shown (Fig. 1) is well well of the final meter. It is genred so that the vertical shaft makes five revolutions to one of the windmill. This shafting extends down the center of the tower and has attached to it pulleys, beed gears and a set of grudner rings. This mill is not used for pumping, as it bs "tigged" only for ordinary mechanical power purposes requiring rotary motion. The economy of such a piece of apparatus will be understood when I state that besides randing the electric dynamo for which it was primarily installed, it takes fits turn at operating and rilippress, gradestone, corrisheller, beelities saw, washing machine, gradu devante, and a feed grinder.

The feed grinder is of the combined for sent type, and as the speed dies down the rings then themselves, heaving them in a condition to start up easily when the what rises. A clutch is used to start and stop the grained in Hiself. Above this is a spring. It case a null or any iron is present in the grain the grinder is immediately disconnected, thu, avoiding the possibility of dunaging the mechanism.

An elevator lifts the grain into a large hopper above the grander, and this also

is started and stopped in a clutching arrangement is a set of four rines which and the grading arrangement is a set of four rines which will grind grahum four, cornned, and buckwheat flour. Connection is also made with a wheat scouring machine and a small "bolter." Thus, on this farm the miller's profits are saved. There is no teeming to the grist mill such basiling flow.

back again. The flour for home use is made from selected grain, and choicest ears of corn are put into meal for the "johnny cakes."

Many a farmer would do well to follow this man's example. Such a wind power is indeed worth the investment, as it aids in decreasing the cost of house living. This, however, is not what prompted its installation. Mr. Forest wanted electric light, and he went the right way to get it. These other advantages were merely "thrown in."

Many people say that a farmer cannot afford luxuries or comforts—that they cost too much for him. But, let us test this statement and see if there is any truth

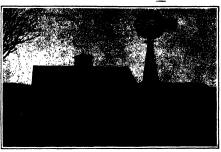


Fig. 1. -- This windmill drives a dynamo which furnishes a current for twenty-four tungaten lamps.



Fig. 2.—The dynamo capacity is 0.21 kilowatt. It is placed on the second floor of the mill, and driven by a quarter-turned belt from a pulley on the vertical shaft of the wind power.



Fig. 3.—Storage battery is in the adjoining barn and accumulates energy given by the dynamo when running, and stores it for use when lights are turned on. FARM ELECTRIC LIGHTING BY WIND POWER

in it. Four acres of potatoes properly planted and caved for will yield a crop of 1,000 bushels, and the cost of plowing, planting, cultivating and harvesting will not resch 850 per acre. Assuming the crop is sold at no more than fity cents per lunch, we can place to the profit of this little patch the sum of \$800, and if the four acres is selected on a portion of the Airas which generally is little used this is clear gain; consequently, the farmer cak at least make improvements on

The dynamo (Fig. 2) of Mr. Forest's electric plant is placed on the second floor of the barn building, which forms the base of the mill housing. Its capacity is 6

answer minto-outlet or 0.21 kilowests. And the distribution of the outlet outlet of the outlet of the outlet of the outlet outle

There is an automatic cut-in between the generator and the storage batteries, which cuts in as the speed runs up, and again drops out as the speed above down, thus preventing the electric current from plowing back into the generator and injuring it through a reversal of its "polarity," This cut-in, therefore, plays a very important part in a windmill driven plant on account of the sudden wind changes. The "cut-in" being entirely automatic, it is kept in a cabinet under lock and key. The storage battery in this particular installation has fourteen cells, each cell installation has fourteen cells, each cell

installation has fourteen cells, each cell giving about two voils, and the capacity of the battery heing rated at 60 amperabours, or enough current for one carbon lamp for 120 hours. The battery is in a separate room in the barn, some distance from the dynamo.

When a potential of 25 to 35 voits is

When a potential of 25 to 35 volts is used for an electric system of this kind we call it a "low voltage" plant, and the lumps must be bought for this low voltage, as they were in this installation.

lamps must be bought for this low voltage, as they were in this installation.

There are, in all, some twenty-four lamps, placed as the owner figured he would need them, and his judgment in this I find was very good. For example, he placed several lights outside the various buildings that he might see his way around and be able to direct his course accordingly. Such a provision also offers protection in the case of desling with persons having nor light to enter the premises means the protection in the case of desling with persons having not light to enter the premises which are the protection in the case of desling with persons having not light to enter the premises which are reported by a surface of the protection of the

#### The Passing of the Punkah

O NE can hardly imagine the hot countries of the Far and the Middle Bast without the punkah, and it is something of a shock to learn from the American consul general at Hongkong that in that colony, at least, the punkah is rapidly giving place to the electric ceiling fan. Few mew buildings in Hongkong are fitted with punkahs, but all are wired for electricity with reference to the use of electric fans. According to the consul general, while punkahs have many meritz—especially in being easily regulated so as to maintain a gentle brease—they estail a sectious loss of light, do not promote active ventilation, as a fan does, and are hard to keep clean.

B. BABBEH are invited to contribute to this department photographs of novel and curious objects, unique occurrences, and ingenious contrivances. Nuch as are usualable will be paid for promptly.

The state of the s

#### A Curiously Eroded Stone

N. 1911

A VERY remarkable example of erosion stable in the secons and the second that has been ground into a fair-tastic shape beginning to the second of the se

#### Photographing a Tornado

WYE frequently hear of the daring of photographers who expose themselves to real dangers in order to obtain unique and interesting photographs. An example of such daring is shown in the accompanying engraving. Last May a tornado occurred in Oklahoma which devastated a section of country near Pocu City, killing a number of people and destroying much property. Notice of the approach of the tornado had been telephoned abased, which gave an enterprising photographer the chances to prepare to record the phenomenon with his camera. He took the photograph which is reproduced herewith, from a house which lay directly in line with the approach of the tornado. The picture clearly shows the funnel-shaped cloud formation. Immediately on snapping the shutter the photographer took refuge in a cave, and as the tornado came on, it completely demolished the house from which the picture had been taken.

#### Humane Method of Slaughtering Animals

THE accompanying photograph shows In an up-to-date and humane method of saughtering animals, which is now being used largely in England. The instrument employed is known as the Behr pistolit is a spring-operated device that projects a sharp blade into the animals, and us no powder is used, the pistol may be piaced directly upon the vital point of the skull so that the aim will be uncerting, death will be absolutely instantaneous, and the animal will feel no pain. A similar instrument, but of smaller pattern, is made for use on dogs, pigs, sheep, and other small animals.

#### An Abbreviated Diver's Helmet

Liew people realise how utterly helpless a diver is when clothed in the ordinary diver's suit topped with the heavy brass helimet. The air that is pumped down to him fills not only the helmet, but the entire suit, puffing it out to such an extent that heavy weights are required to keep the man down. The diver cannot possibly move about like the swimmer, but must signal to the tenders above when he wishes to be raised or lowered. The gloves upon his hands are cumbersome, and the work that he can do is really vary limited. One of the numovance, the most resching of the first the control of the control of the state of the control of the control of the state of the control of the control of the state of the control of the control of the under water, and he was obliged to endure all the torture of having the insect crawl over his face without any possible means of reaching it to destroy it or even brush it way.

Evidently conditions such as these influctuded a French inventor to devise a diver's outil which dispenses with everything but an abbreviated form of belmet. As shown in our illustrations, the outil consists of a cap of rubber which fits closely over the diver's head, covering his saws so as to prevent water from entering



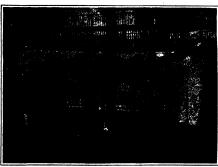
An oddly eroded stone.



A thirty-foot ice column.



Photograph of a tornado taken from a house that was wrecked a moment later.



Slaughtering a steer with a bulletless pistol.



A simplified diver's believe that dispenses with an inflated suit.



Diving down to the work as free as a swimmer.

them. There is also a strap that fits over the mouth and bears the air supply device Air is pumped to the diver in the usual way, through a pipe while he air rached to his helmer at the back of the neek. Thus employed the diver does not rought which the diver does not rough the case of the committee of the work and swim up again to the surface. To assist him in descending he is previous with a weight, which he carries in his hand. This is tied to a cord, by which it may be recovered when the diverdiscards if Having far greater freedom than the ordinary diver, he can do far better work under varie.

#### A Stalagmite of Ice

The not often that one sees a column of the in the two two standing thirty teed in height like a globalty white monument Such a column was recently to be seen in the vicinity of Schronn, New York The column had the appearance of a stalagmite of duzzling whiteness and it proved to be a hollow pillar The causes that gave birth to this beautiful column of few were simple enough, although to the unhaltitated the puzzle was extremely beffling. The monstrous staingmile stood about halfway between an old stock farm and the mountain reservoir which supplied spring water to the house and barn. A vent plug was removed, permitting a fine jet of water to shoot up thirty feet into the an and gradually build up a hol low cylinder of ice. The column proved a great attraction, and created wide-spread interest. People came from miles around to see the curlous spectacle.

#### Mufflers for Aeroplanes

R ECENT experiments with a muffling box on board an aeroplane which were made near Paris proved quite successful It is recognized that the great noise of the motor has its drawbacks, as it less-ens the comfort in flying and fatigues the pilot as well as causes annoyance to passengers In military work, the noise prevents the officers from hearing sounds which come from the ground, and these would often be a useful factor in observa-Pilots cannot use their voices to any extent. Another point is that were the motor silent running, the observers could hear sound signals coming from aeronautic quarters, and could also re-turn signals to the ground, by using trumpets of different pitch or sirens as are used on vessels. The present tests were made at the Astra aeroplane establishment near Paris with excellent results, using a biplane fitted with a Renault motor of the 50 horse power type placed to-ward the front. The motor has two sets of 4 cylinders each, and the gas is taken from each set by a 2 inch copper tube and is sent into a common muffling box This last has a 6-inch diameter and 30inch length and was taken from a Renault 14 horse-power automobile mounted underneath the neroplane, It is the gas escapes from the box by a 2-inch copper tube placed so as to direct the gas toward the rear. The tests took place before a military commission, and during the flights it is said that the noise of the mights it is said that the noise of the motor was much reduced so as to al-low the pilot Laboutet to speak to the persons on the ground when he was flying at 300 feet. The muffler box does not overheat owing to the strong air cooling which it receives. It is intended to use another box which is better suited for the power of the motor, and it will be mounted below the upper wing of the aeroplane. The loss of power is below 2 per cent, as shown by measurements

#### A Unique Exhibition

AUNIQUE exhibition took place reently in Ledysig, Germany An amateur of Chemittz has built up the battle of St. Privat in all its details with the aid of 14,000 tin soldiers. To give an idea of the work required, it may be mentioned that it took fully six years to complete the grouping

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### An Electrical Scoreboard

A NEW scoreboard has appeared, a very large apparatus with figures and names of such dimensions that they may be plainly or such dimensions that they may be plant read from long distances, the face board being 16 feet square. In the center of this is a well defined field, 8 feet square, of cop-per wire, planted green, with the "dia-mond" of light brown. Beneath this field a thousand lights are so ingeniously arranged that a continuous line may be de-scribed to any part of the field. Thus any combination of movements of field men (in white lights), of player (in green lights), (in white lights), of player (in green lights), and of the ball (in red) may be shown, all working simultaneously, the different col-ored lights assisting in the quick under-standing of the "play."

standing of the "play."

The unique feature of the electrascore and the one which marks it as essentially different from other similar devices, is that different from other similar devices, is that the ball and the players are in constant and actual movement all the time. It is not merely a jump from base to base, etc., but a line of light showing the path of the men is flashed across the field. In like manner the course of the ball is followed. from putcher to batter, into any field, to

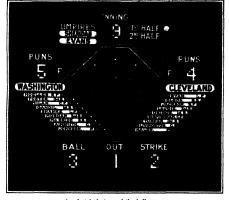
any fielder or baseman, etc.

Beyond the screen field the face board is taken up with boxes for innings, balls taken up with boxes for innings, balls, strikes, etc., in figures of lights fully 14 inches tail. The half innings are desig-nated by a big light. The names of the men of the contesting games are amply large, beside which stands a "lightman" to designate those who will be called to the arrives to take the bat. When a man is called to the bat, the "lightman" at once proceeds to walk from his name in an actual path to that post. From this it may be readily realized that 1,500 lights of four eardile power were none too many in the construction of this invention.

The roar of the board is a marvel of con-densation of levers, switches, stops, etc., for making connections with figures, the ball and the man. The many thousands of feet of wire combining the various lights are gathered in several heavy cables and then redistributed to their proper points of contact. The operator plays the game on a numature copper scoroboard, making the contacts for movements with the stubs. This may be considered a replica of the field on the face board.

The economic and convenient arrange-ment of the scoreboard is one of its merits. Twenty-three thousand feet of wire traverse the device in a skillful manner. T entire weight is estimated at a ton. face board stands up-right, with the real construction, though amply large, well concealed from the spectators. The voltage necessary may vary from 210 to 220, with the latter preferable.

The easy manupulation has simplified matters for the operator, dospite the fact that so much is described on the face.



An electrical story of the ball game.

The invention is provided with telegraphic be readily adjusted for exhibition purconnections, which may come direct from poses, it may also be set up in the open, if the field of the game or a local wireless given attilicint space. It is exactly posstation.

While the Nokes electrascore is perhaps of a newspaper building, as most of the 
best appreciated in a theater, where it may immaller score boards are done at present.







Keyboard arranged for syllable typewriting.

In other devices of this chara am has been to give the result or final of a movement of a man from base to base or the course of the ball from the pitcher to the course of the ball from the pitcher to the batter or one man to another. As to the details which bring about this result, the baseball flan at the scoreboard is igno-ant until be reads the newspaper. The electrascore, however, accomplishes this through the mass of lights under the screen field. It is this feature that causes the faccination for this counterfeit game. Bepecially is this true when baseman, player promise in time true when baseman, player and ball are having one grand scramble to gain the point, on which may hang the victory or failure of a team.

# Machine for Typewriting by Syllables

THE idea of syllabic typing must be as I old as the idea of the typewriter itself. Our words are made up of syllables uttered singly or in combination. Each syllable represents a single vocal impulse. Why not print the entire syllable at a single manual impulse, permitting the separate flagers to take care of the separate letters which are combined to preduce the syllable. If this could be done it would take less time to tweewife a thing than the syllable. less time to typewrite a thing than to speak it, particularly if the machine could be arranged to print even more than one syllable at a time.

A rather promising machine of this

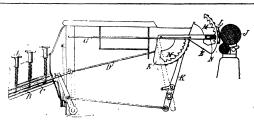
type has recently been brought out by type has recently been brought out by Turin. Reproduced herewith is the ar-rangement of the keyboard. The keys for figures, punctuation marks and various

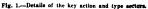
other symbols are not shown, although they are provided in the machine. In operating this machine the typist works from left to right. The type are arranged in groups on sectors and all the characters arranged in a single vertical row on the keyboard are to be found on row on the keyboard are to be found on a single soctor. Thus, taking the first row which consists of the Q, V, D, and Z, it would be impossible to print both Q and D by depressing the key in the first vertical row. To print QD it would be necessary to depress Q in the first row with the left hand and D in the row with the left hand and D in the tenth row with the right hand. To write the word "owe" the typist depresses the key O in the sixth row, W in the seventh row and E in the sighth row. It will be observed that the keyboard is so arranged that practically any spoken syllable may be typed at a single stroke. Where this is impossible the syllable has to be divided and printed in two strokes.

The number of letters which may be

typed at a single time depends upon the number of sectors. If one had fingers enough he could print an entire horizontal row of keys at a single operation. How-ever, ordinarily an eight-lettered syllable, such as the word "thoughts" represents

and the same of th





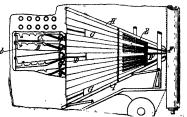


Fig. 2.—Plan view showing the tapered slid

printing ament of a single printing, printing is not done when the keys depressed but when they are released not necessary to strike all the letters of a syllable at the same instant. The may be depressed successively. A each key is depressed it turns the sector until the corresponding character is to be brought up to the printing position. The depressed keys will be held automatically in set position until the last key is released. Then, as all the keys return to normal position, the printing of the entire syllable will be accomplished and the carriage will be moved correspondingly to receive the next syllable of the word. When the last of a word is struck the space bar must also be depressed, so as t the space between the words. d, so as to allow for

the space between the words. Part of the mechanism employed in the syllabic typewriter is shown in the accompanying drawing. When the key A is depressed it rocks the plate B, removing a pin b from contact with a tooth on the aliding plate C and permitting the latter to move forward under action of a spring to move forward under action of a spring until one of its teeth ongages with the stem of the key. By referring to Fig. 1 it will be observed that the lower end of the stem is bent to torm a hook which ostehes under the tooth referred to, and holds the key in depressed position. The catches under the both reserved to, amendids the key in depressed position. The forward movement of the slide plate C is communicated through the rod D to the type-bearing sector E. The relative position of the stem of the key and the slide of the key and the slide of that negative it is position or the stem or the key and the tooth on the plate C that engages it is such as to swing the corresponding type on the sector E to the printing position. By referring to the plan view (Fig. 2) it will be seen that each sector is carried by a slide D of tapering form, so that the entire series presents the form of a entire series presents the form of a When a slide G is moved forward fan. carrying the sector to the printing point, owing to its tapering form it crowds to the right all the slides D that lie on the the right all the slides D that lie on the right. The slides are prevented from moving to the left by a fixed bar H while the bar I on the opposite side is yielding and is connected by a pair of links to the frame of the machine, so that when it is displaced from normal position, it has a parallel motion. Any number of the a paratic motion. Any number of the slides D may be moved forward to the printing point, causing the bar I to yield correspondingly. The taper on the bar D is so chosen that the displacement bar D is so chosen that the displacement to the right causes the sectors to come to the printing point P ade by side. On release of the last key, the sectors are moved simultaneously against the platen J by means of a bar N and arm K which are actuated either by a small electric motor or, as in the model illustrated, by a spring motor. Just before the type strike spring motor. Just before the type strike the paper an inking ribbon L is swung up between the platen and the sectors. It will be observed that the sectors E are provided with notches M which are adapted to be engaged by locking bar N. This insures proper alignment of the type. The ratchet mechanism that moves the carriage to the left is controlled by the carriage to the left is controlled by the movable bar I and bence will move the carriage through a space equal to the number of characters printed. As a motor is used in connection with the machine, power is used to return the carriage to power is used to return the the right for a new line, on depressing a lage shift key.

#### Graded Suspension Insulators

To the Editor of the SCIENTIFIC AMERICAN: In an article entitled "Some Problems of High Voltage Transmission," which appeared in the proceedings of the American institute of Electrical Engineers for March, 1912, Dr. Charles P. Steinmetz

states :

"With a number of equal insulating disks sharing the voltage between line and ground, the potential difference across the insulators nearest the line is higher, and the potential difference across the insulatoe possential directions arose the insual-tors meases the ground is lower, than Jimpel of frost-lichterfolds, some Berlin, the average potential difference per la-guage of the second of the second of the second period of the system, has secured patent No. 1,008,170 system, has secured patent No. 1,008,170 system, has secured patent No. 1,008,170 system of insulative disks. Also, "From The mass is composed of glue, linseed oil, thig it appears that the use of a large shark oil and alung.

per of amail insulator disks is uneconumber of amail institute class is uneco-nomical at very high voltages, and a few large disks of high disruptive strength are preferable." Also, "To extend the in-sulating possibilities of the suspension insulator type far beyond the voltages now contemplated, therefore, requires a grading of the insulator disks in their apacity, so that the disk nearest the line has the highest, that nearest the ground the lowest capacity, or the addition of capacity at the surface of the insulator disks, in proportion to their distance from

Illustrated herewith are two forms of high-tension insulators which have been patented by the writer. These were filed respectively, on September 23d, 1907, and December 4th, 1909. They disclose that as early as 1907 the writer understood and appreciated the value of graded suspension insulators for high-tension current. It is now conceded by many of the



Types of graded suspension insulat

foremost electrical engineers that insulation of the graded suspension type is the best practice, as it insures reliability and continuity of service, under the most ad verse conditions, providing means at the same time for keeping the line in o tive condition even though direct light

ning strokes should reach it. Brooklyn, N. Y. Louis Stringer

#### Notes for Inventors

Geographical Index for Clocks.--In No 1,034,496 Jean B. Olinger of Milwauke, Wis., provides an attachment for clocks for showing upon an ordinary dial the hours for various principal points or countries all around the earth. nt invention is an improvement upon one shown in a former patent and includes a dial in the form of a star having twelve arms or rays. It is adapted to be attached to the hour-arbor and each of the arms carries at its extremity an inde guides the eye to the proper point of the clock-dual to give the time at the point to which the arm or ray is appropriated.

A Bottle That Has a Measuring Spout. Meredith Clark of Garden City, New York, in patent No. 1,034,424, combines a measuring device with a bottle neck. It is in the form of a spout secured to the neck and the measure is so pivoted with relation to the spout that the bottle can be tilted in one direction to pour into the measure and in another direction to discharge the contents of the measure.

contents of the measure.

Patents for Treating Starch.—A series
of patents, No. 1,035,829 to No. 1,035,842,
have been issued to Alexander P Anderson
of Chicago, Ill., relating particularly to the
art of treating starch materials, starch,
flour and flour products. Some of the
patents relate to the making of starch pebbles, some to the art of puffing starch con-taining flour and some to the treatment of creal grams.

A Filling for Vehicle Tires.- Rudolf

RECENTLY PATENTED INVENTIONS. These columns are open to all patentees.

notices are inserted by special arrangem
with the inventors. Terms on application to
Advertising Department of the Schwarz

AMBRICAN.

PEED BOX—A. W. Waspoor and O. F. Samre, Chill, Wis. This invention provides an inexpender long lived box of plastic material, so constructed as to prevent wasting of feed while permitting the entire content to be got at. Use of the rib will prevent wasting of the feed in the box by the stock, and the animals cannot three or injure the box which is or plantic material.

#### Of General Interest.

Of General Interest.

NON-HSPILLABLE NOTTILE—L. AREAVAT, TAMPA. FIA AR object to this instance is to provide a device which will permit the interest of the provide and the

of the operator free, and which carries a longue depressor and an illuminating means. DOWEL—II HARKID, 73 86 Maple 8C. Spokane, Was This invention is an improvement in devel construction, having for its by to avoid the necessity of mortising and tononing in doors, such or other wooden frames and to provide a now construction. PROCESS OF MANUPACTURINS KIN STITUTES FOR OILS, CAOUTCHOUG, RERINS, AND THE LIKE.—L. Latersfeld, Editable 1978 of the control of

processing for those binding security that an extending the solvents that control to an event that process are considered to the control to t

cane to another.

COMBINDO CALK PLATES AND CARRIBER—4. 8 Merrs, Newburgh, N Y This
investion relates to attached calks and
mean for attaching an another state of the color

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color of the color of the color of the
device forming the subject of a previous pat
ent granted to Mr Meyer. The present invoucino provides means to restate the tendency
of the calk plates and their carrying frames

gravity.

service.

DINTAL APPARATUS.—F. E Buck,
Forgth and Main Sta, Jacksonville, Fia The
oliget here is to provide an easily operated
device, wherein a holder is provided having
a perforated hottom, and mounted to per
mit a maximum adjustment, both laterally,
angularly and vertically, and wherein any
adjustment may be made with one hand, and
with a single handle.

with a single bandle.
CONCRETE MOLD.—C. H. F. DYBROPP,
565 Miller Ave. Spencer, Jowa. This invention provides a mold having upright posts for aupporting the moid boards, secured together by the which are tapering, so that they can be restilly knocked out without disturbing the material of which the wall is formed, and further, so that they can be replaced in the openings thus formed resulty without Jam-

minz.

CHAIN LINK.—W. D. TURTEN, 787 Macon St. Brooklyn, N. Y. This improved chain comprises a number of links made in sections movable with respect to each other to permit the chain to be distended whenever desired; as, for instance, to permit the leagth of the chain to be increased when it is to be used in its to be used in its contract of the chain to be increased when it is to be used in its contract of the chain to be increased when it is to be used in its contract of the chain to be increased when it is to be used in its contract of the chain to be increased when it is to be used in its contract of the chain to be increased when it is to be used in its contract of the chain to be increased.

the form of a bracelet or armlet, so as to enable it to be slipped over the hand into position.

position.

COATED METAL WIRE RUBBER
FABRIC -R M. Bussill, eare of Mrs R M.
Blasell, Valcour. N Y women the principles
objects which the present invention has in
view are to provide an air and waterproof
fabric baving a reinforcing metal structure,
and to provide in a fabric of the character
mentioned a metal puncture resisting surface.

#### Hardware and Tools.

Hardware and Tools.

TRINK LOCK — J. BREWER. 220 E. 80th
K. Manhattan, N. Y. N. Y. M. Pierweis's
lavention has reference to truth locks and
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parts associated therwith, his nowe particular
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any bas or receiptacle or even upon doors
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difficult to upware any ordinary served wither
ALINING PLATE FORE PLOWE HINGES

O KATARISHORI, CHARLES, LOWER OF
ALINING PLATE FORE PLOWE IN those
dege of the door and the central portion of
the door jamb when the door is in those
position, without depending on the serves in
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constraints. See the life of the life o

and higher, and of softening over the for mass affying these spirit levels aritying these spirit levels CORKSCHEW-E Rasias, care of Earle Fros., Townstill, S. C. in this case the object is to provide a simple and easily operated from slipping or polling out of the cork, or the pulling off of the top of the cork, or the pulling off of the top of the cork, or the pulling off of the top of the cork, or the pulling off of the cork of the cork of the cork of the pulling off of the cork of the cork of the pulling off of the cork of the cork of the pulling of the same of the cork of the pulling of the same of the proper is blaged to the shank of the made law, a ratchet device being applied at the plant to operatively connect the handle and law, a ratchet device being applied at the plant to operately of the pulled in ordinary of the pulled in ordinary of the pulled in the construction and considerated the construction and construction

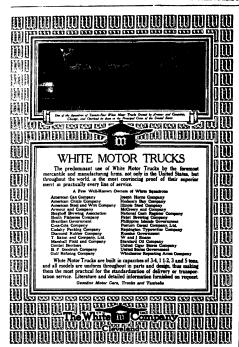
Machines and Mcchanical Devices.
HOTEL IRSHITEEL J W TIMMPRON,
Portland Ore In this Instance use is made
of a casing having a display opening for the
passage of the web passaing over a bed plate
and winding on rollers arranged within the
casing, as motor located in the casing, and a
specially constructed genting, driven by the
said motor and adopted to be moved into driv
a travellag motion to the web in either direction.

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California we are a second optimized as to validity or infringement of patents, or with regard to conditions arise in Trade mark and unfair competition matters. However, the matter we also have more larger throughout the wear and the second trade mark applications, filed in all countries forcign to the trade of trade-mark applications, filed in all countries for the second trade of trade-mark applications. May a Co., Patent Affections, May a Co., Patent Affectings, Second Control of the second control

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## A 10,000-ton Motor-driven Ship (Concluded from page 200.) that with revolutions of from 140 to 145,

there was a gain of only three revolutions while the propellers were out of the water.

The ship carries 1,000 tons of oil in her deathly bettern double bottom. She left Hamburg with

double bottom. She left Hamburg with a supply of 470 tons and rescaled Havana with 290 tons, having run at full speed with a fuel consumption of about 10 tons per day. The engines, being new, were run at only 135 revolutions per minute for the first few days; later this was ruised to 142 revolutions. The best days run to 122 revolutions. to 142 revolutions. The best day's run was 329 miles, at an average of 1.3 k mots per hour. It is expected that when the engines are shaken down the ship will be good for an average speed of 13 knots. The fuel consumption for the main

The ruel consumption for the main engines and all auxiliaries worked out at 0.34 pound per indicated horse-power per hour. Outside of this economy in fuel consumption, the adoption of the oil motor for transatiantic ships such as this presents many and great advantages. In the first place, in a ship of this size, 1,000 tons additional of freight can be carried. tons additional of freight can be carried, due to the fact that the space that would have been given up to the boiler plant is now available for cargo. Secondly, there is a reduction of fifteen men in the crew, namely, six stokers, six trimmers and three oilers. The present engine room force consists of seven engineers, one store keeper and one electrical engineer. Th engines ran throughout the trip to Havana with great regularity and without a single stop during the whole seventeen days consumed on the voyage.

An estimate of the economy in this ship over one driven by steam engines, shows that in one hundred days of operation there would be a saving of about \$13,000, or say, about \$50,000 in a single year.

#### A New Principal Examiner

HARRY C. ARMSTRONG, until re-cently first assistant examiner in Division Three of the United States Patent Office, has been appointed primary examiner in charge of Division Eleven the vacancy thus filled having been cre ated by the recent death of Edward H Eakle, former principal examiner.

'Mr. Armstrong was born in Indianap olis, but removed with his parents at the age of twelve to Massachusetts, attendthe excellent schools of that State, and completing his studies at the Worcester Polytechnic Institute.

After a useful experience in the works of the Washburn & Moen Co., Worcester, and the Thomson-Houston Electrical Company at Lynn, he was appointed an assistant examiner in the Patent Office in the summer of 1894, and has passed through the various grades to his preent high position

Mr. Armstrong, on entering the Patent Office in 1894, was assigned to the class Office in 1894, was assigned to the class of metallurgy, and has remained in the or metallurgy, and has remained in the division, having charge of such subject throughout his entire eighteen years of service, having during such period an opportunity of observing many of the remarkable advances made in the steel and allied arts during the time men-tioned. The metallurgical art, concerning itself mostly with the production of iron and steel in all its untold ramifications, it is needless to say, calls in its examination for more than ordinary skill, knowledge and judgment. How well Mr Armstrong has acquitted himself, in charge of important subject, can be esti mated by the high regard in which his abilities are held by his co-workers, superiors and the attorneys having dealing

On two occasions Mr. Armstrong has been assigned by the Commissioner of Patents to important missions, represent-ing the Bureau at the Patent Office exlibits displayed in the Seattle and James town Expositions.

The new duties Mr. Armstrong is called The new duties Mr. Armsrong is caused upon to perform bring him into contact with the perplexities with our infricate shoe machiner; as well as the manufacture of harness and other leather articles and boots and shoes per se and open up a large and interesting field of labor.

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#### INQUIRY COLUMN

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## The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective own-of motor trucks and delivery wagons. The Editor will endeavor to answer questions relating to menhanical features, operation and management of merchal motor exhibits. -

S ERVICE, better service than can otherwise be secured, is the keynote novel ways, and the following is a good

A Jersey City milk company has to haul a large quantity of milk every night to a point in the interior of Staten Island. A motor truck is now used, and it makes two truck is now used, and it makes two trips each night, carrying on each trip one hundred forty-quart cans, each weighing 110 pounds. The present route covers a run of eight miles from the discovers a run of eight mass from the dis-tributing station in Jersey City to the Hergen Point ferry, and a run of two miles after reaching Staten Island, making a round trip of twenty miles, or forty miles for the night's work. The ferry tolls are thirty-five cents for each passage, or a dollar and forty cents per night.

It was impossible for the horse teams

which formerly did this work to take this ceiving \$12 a week, whereas an experi-route, because they could not cover the to deliver the milks over steep grades fast cough truck to assist in packing, routing and to deliver the milk on time. Consec delivering the goods Thus, the expense questity, two teams were sent from the for labor in connection with the motor distributing station over the Eric Rail | truck is 835 per week as against \$27 for and forty to New York, the foll beling a like horts-drawn van. This extra extension and the state extra extension of the state extra half dollar for each team. From there it is a mile to South Ferry, and the toll on this ferry to Staten Island was seventyfive cents for each team. Thus the ferry tolls amounted to ten dollars a night, for day so that the men and machine are two round trips for two teams, against a dollar forty for the motor truck. As this delivery has to be made every night in the year, the saving effected by the motor truck is \$3,139 a year. As the motor truck displaces four horses, it undoubtedly effects an additional saving in this direc-

#### Motor Delivery of Furniture

A "SWINGING LOAD" of furniture, or A one that projects beyond the tailboard which have proved highly efficient for of the van, will manify weigh anywhere city deliveries in many and varied lines from 2,000 to 2,500 pounds. new furniture and not the heterogeneous and solidly packed household effects to be found in the moving van. A load of 2,500 pounds can easily be managed by a team of horses on ordinary city streets, and, so far as load is concerned, there appears to be no advantage in substituting motor trucks for the horse-drawn vethat the motor van cannot be more heavily loaded than the horse van.

In the delivery of furniture most of the time consumed is not in travel upon the la every way than a heavier truck, which road, but in the packing of the furniture in most cases solid tires, while the to the best advantage and so that it will lighter veshelic can easily use pneumatic to the best advantage and so that it will be readily accessible, and more particu-larly in the delivery of the furniture. larly in the delivery of the furniture. An interesting test was made during Tedious waiting for the freight elevator the past year by the Fuhrmann-Schmidt seems to be the rule rather than the exception. At the height of the furniture exception. At the height of the furniture season the moving man is constantly found in possession of the elevator. Thus, it is common to reckon the packing, trans-porting and delivering of a "swinging load" of furniture as a full day's work. otor vehicle, because of its higher a motor venice, secared in a material speed, could not possibly save enough time to permit of sending out two loads per day. However, when it comes 19 long distance delivery, the motor truck

s up to better advantage. shows up to better advantage.

Owing to competition with department steres, a large furniture house in New needed three men to manage it. The extent truck reserved, a large furniture house in New needed three men to manage it. The extent truck extend its peeded three men to manage it. The extended in the control of the

Saving Three Thousand a Year in day trip and called for the board and lodging of the teamster and his believe.

ERVICE, better service than can date horses at some inn over night.

Last spring two first-class gasoline trucks were purchased for the suburban delivin most cases where they are used, however, they show more or less economy over
horses which formerly did their work. In
some instances this economy is secured in
now ware, and the following the control of their most property ware, and the following the control of their most property ware. And the following the control of their most property ware, and the following their most property ware. vehicle has undoubtedly shown its super-iority to the horse-drawn van. With the iority to the horse-drawn van. motor truck round trips of 65 to over 100 miles per day are easily taken care of. The record of one of the motor trucks for the month of August was 1,103 miles for twenty trips, some of which were as much as 105 miles long. The total number of stops for the month was 166, and

the average running time for the entire period, 8.8 miles per hour. A single me-ter truck did more than twice the work

of a horse-drawn van, and the over-night

expenses out of town were saved.

To drive the motor truck, an experionced chauffeur at \$20 a week was required as against \$15 per week for the ordinary teamster. The driver of a van is usually accompanied by a helper retruck is \$45 per week as against \$27 for the horse-drawn van. This extra ex-pense, however, has been outweighed com-pletely by the excellent work of the motor truck. It is a decided advantage to have the entire delivery completed in a single always housed at home Quite aside from the saving in cost there are other important considerations that must enter in-to the reckoning A motor truck always looks better, gives a better impression, and is liked better by the customer than

The company has come out unquali-fiedly in favor of the motor for long hauls, but still prefers to use the horse for city delivery However, it has made no experiments so far with electric trucks

a horse-drawn van.

## Light Trucks With Pneumatic Tires v. Heavier Vehicles With Solid Tires

By G. H. Bryant

T HOSE manufacturers of commercial motor vehicles who have stuck to the es; because the material is so bulky light-weight truck with pneumatic tires present some very strong arguments in de-fence of their production. It is claimed that a light truck is much more efficient

> Brewing Company of Shamokin, Pa. The test was made with a light one-ton truck equipped with pneumatic tires and a seven-ton truck with solid tires. The trucks were pitted against each other for one day's work. The one-ton truck loaded, hauled and unloaded fourteen loads of beer of fourteen half-barrels each trip, or a total of ninety-eight whole barrels. The seventon truck hauled, in three trips, ninety-nine barrels, carrying but one more barrel than the lighter truck. The one-ton truck was managed by one man, who both load-

# Pick your tires as you would your trucks

Suppose you were offered a truck that carried with it a definite guaranteed cost per mile of servicea lower cost than you had ever known a truck to be operated on before. Would you consider such a truck a safe investment?

If, in addition, you were positively assured that your deliveries would never be delayed a single hour on account of repairs or adjustments—

If you were shown that the truck was so extremely simple that the driver could do all the necessary repairing himself-

If you found that doing away with the necessity of repair shop assistance gave to the truck practically an unlimited radius of action—

You would probably buy that truck.

You may not be able to secure such a truck at present, yet it is a fact that *today* you can at least buy motor truck tires that actually do possess these same points of superiority.



Cross section view of United States Motor Truck Tire

A Tough Rubber Tread C - Metal Base E-(rate) Wedge Ring
B-Hard Rubber Base D-Inside Flange Wedge Ring F Outside Flange Wedge Ring DIRECTIONS FOR USING

# STANDARD DEMOUNTABLE UNITED STATES **MOTOR TRUCK TIRES**

Are absolutely guaranteed for 10,000 miles of service conditional upon its being used within one year's time. Such a guarantee was never heard of before the advent of this

Delivery delays are done away with. Instead of being compelled to tie up your deliveries for a day or two while a wheel is being sent away to some distant repair shop for a tire replacement, you may now make a tire change (even a dual tire) in your own garage in fifteen minutes' time.

Repair expense is abolished. The driver is now the tire repair man. A hammer, a wrench and two hands comprise a complete tire repair shop equipment.

Radius of action unlimited. Instead of being tied down to a tire repair shop, a truck carrying a spare United States Tire may now go anywhere that gasoline can be bought.

Possessing these distinct points of superiority makes the selection of United States Tires absolutely imperative to every truck owner who is bent on getting his operation cost down to rock-

United States Tire Co.

# 926 G. V. Electric Trucks are operated by 25 firms

That's an average of 37.1 per customer. 100 firms use over 1300 G. V. Trucks. A horse and wagon is a horse and wagon, nothing more. An Electric Truck on the contrary may dump coal, hoist safes, warp its load on with a winch operated the contary may comp coal, nose sares, warp as nose on with a which objects by its own battery, pump water from a deep manfule, towa dead trolley car around the curve or take its load across the floor of a great loft after car and all have been taken up in the clevator. It shows better than anything clse the possibilities of the new way of moving raw material and merchandise.



American Express Truck
One of 65 G V Trucks used by American Express Cos

Let's forget the word "Automobile" and substitute "Transportation." Making Motor Truck pay is a big, big science. The Electric for the city and the gasolene truck for long distance work beyond the radius of the Electric is the story. Efficiency engineers will soon tell you the same. Scores of our 1902-01 models are still running, many of them working side by side with our 1912 product in these bug fleets. Our newer trucks are standardised, have interchangeable parts, more miledge, low depreciation, low operating costs. 69.5% of 1911 business reorders. Age, prestige and ample capital back of everything we build.

G. V. Electrics are made in six capacities. 750 lbs., 1000 lbs., 2000 lbs., 2-ton, 3½-tons, and 5-tons. Thousands in use.

We aim to sell our machines only for work in which they will give the buyer absolute satisfact
Correspondence solicited.

Write for "The Electric Truck As An Investment" or for illustrated catalogue 101

# General Vehicle Company

Principal Office and Factory, Long Island City, New York

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# The Edison Storage Battery in the Electric Truck



Doesn't it seem a natural thing to use the EDISON BATTERY of half the weight per unit capacity of a fairly serviceable vehicle type lead battery, and, furthermore, with a guarantee to be capable of developing full rated capacity at the end of four years of active service, irrespective of the total miles traveled by the vehicle, or the number of charges, discharges and "boosts" which the battery has been given?

The business men in Chicago are alive to this situation. Out of a total of 115 electric trucks purchased in Chicago during the first six months of 1912, Edison Batteries w manded on 95 of them. Chicago was "shown" last Winter, when the Edison equipped Field Buses and the Edison equipped trucks kept going through the blizzard weather when street cars, gasolene trucks and other trucks were

The Adams Express Co. is operating about 400 electric trucks equipped with Edison Storage Batteries as compared to about 30 equipped with other batteries-this after a test lasting nine years.

Points to remember about the Edison Battery when purchasing an electric truck are Light Weight (a saving on tires) and Long Life; No injury from short circuiting, overcharging or from being left standing indefinitely in a charged or discharged condition; Low maintenance cost; No expert attention required; Operation and care simple. Let our experts give you advice as to your battery equipment-don't hesitate to ask us questions.

You can see Edison Batteries being manufactured at the Boston Electric Show, September 28 to October 26, 1912.

The Edison Storage Battery Company 132 Laketide Avenue, Orange, N. J.

mobile is merely a matter of proper con struction and proper tire size. Hudson Maxim, the noted inventor, says, "If the Maxim, the noted investor, says, "It tas load on pneumatic tires never exceeds the clastic limit of the rubber it will endure a very long time, whereas if loaded but slightly beyond the clastic limit, they soon go to pieces."

In overcoming tire troubles thr have to be considered; weight of the car. the size of the tires and the riding ease The makers of the light trucks using pneu matic tires have in every way made light weight the strong point of their construction, using full-elliptic springs and a flexible frame to aid the tires in absorbing road shocks. On a car with a rigid frame and stiff springs all the cushioning of the road shocks must be borne y the tires. Consequently, the rubber and fabric are unduly strained and break flown before their time.

That light weight has a marke

ence in prolonging the life of the tire equipment is supported by results of care-ful experiments made by Michelin, the noted tire manufacturer. These experiments have proved conclusively that every five per cent increase in the weight of an automobile adds fifteen per cent to the wear on the tires Hudson Maxim leclares that every twenty-five per cendecrease in the weight of an automobile means one hundred per cent added tire service.

Pneumatic tires and resilient shock-at recumatic trees and resident shock-to-sorbing construction overcome the de-structive action of driving over rough streets and permit a good average speed which is necessary in efficient truck serv-Not only do they save on the repair of the car, but they take better care of the load carried, not causing it to endure a perpetual succession of severe road Pneumatic tires make the truck sincess. Precuminic tires make the truck ride more easily, and it does not soon be-come a rattling old vehicle like many of the old-time horse trucks.

#### Subsidized Motor Trucks By John R. Eustis

FRANCE was the first nation to recog port service and has developed a subsidy plan which has been largely followed by the other governments. Under this plan the French government has now at its command in case of war upward of 2,000 motor trucks, or the equivalent of at least 12,000 horses or mules. These motor trucks are regularly engaged in private government for each vehicle six hundred dollars at the time of purch hundred dollars for each of the three following years, a total of twelve hundred dollars. In return the owner agrees to keep the truck in good running order and its driver, any time on demand.

Motor trucks eligible for this subsidy must, however, be adapted for army transport service. There are held an-nually in France, under the direction of the War Department, trials in which all cturers of motor trucks are invited to participate.

trucks which have qualified in these annual trials sell much more re ily than those which fail or which did not participate. The manufacturers, therefore, spare no efforts to win, and the engineering and commissary departme of the French army do their best to make the requirements sufficiently severe to show up any and all weaknesses.

This year's trials have just ended. Six-ty-two trucks participated, representing thirty-two distinct models, made by sixteen different manufacturers. They were under military supervision and observa-tion for an entire month, during which tion for an entire month, during which they made twenty daily runs over routes radiating from Versailles, the total dis-tance being 1,558 miles for single trucks and 1,225 miles for trucks hauling a trail er. The runs and to be an inconvey formation load, both singly and in convey formation bened without load, and with gasoline, bensol and alcohol as fuels. An officer rode on each truck as observer, and a careful record kept of fuel and oil communities.

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the final award.

Following the road trials a careful examination was made of every part of each truck. One or more important units on each truck were dismounted, such as rear axies, jackshafts, gear boxes, road wheels, motors, and steering gears.

The French motor truck industry is reatly benefited by these annual trials. The army service requirements have tended to standardize wheels and tires, bodi and body fittings; under clearance and track; they have made radiator protectors an essential and hooks front and rear for hauling purposes; they have cut down fuel consumption and done a great deal

toward developing accessibility.

One of the most important results of these requirements is the development of carburetors with which gasoline, benzol or alcohol can be used as fuel. It was not the price of gasoline, which is very high abroad, so much as the possible stop page of the supply in case of war, that gave rise to this requirement.

In another particular, that of develop-ing motor trucks which would run satis-factorily on steel tires, the French government has not been successful. At first only steel shod trucks were allowed to qualify for the subsidy, and now their use s encouraged by making wear and tear on tires count heavily in figuring the cost of operating, thereby giving steel big advantage over rubber tires. this, steel tires were used less this year than in any previous trial, and not one of the trucks shod all around with steel was able to qualify. A number used rub-ber tires in front and steel on the rear.

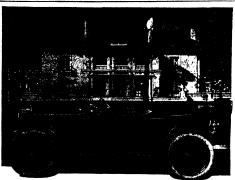
and some of these qualified.

Outside of the purchase of a few score vehicles, most of which are used in the Philippines, the hiring of a few at different times in the past two years for use at various maneuvers, the promotion of two short tests and requesting manufacturer to furnish the names and addresses of all purchasers, our own Government has as yet done nothing toward utilizing motor trucks in army transport service. There are, however, more motor trucks in this country than in any two foreign countries combined; and in case of war our Gov-ernment could purchase all it needed at a high price.

#### Discovery of a New People

(Concluded from page 261.)
Cape Bexley a recently abandoned village of forty snow houses was discovered on May 12th, 1910, with sled trails leading northward to Victoria Land. One hour later-- in the middle of the frozen Dolphin and Union Strait—a man was dis-cerned. He was sealing Stefansson seal his Eskimo companion to interrogate him The sealer drew his knife and a attack of the emissary. After fifteen min-nies of excited parieting in different dialects—for the scaler and the emissary spoke widely different dialects of the same tongue—peace was established. Stefansson then drew near. He speaks Eskimo himself; for the modern ethnologist is thoroughly acquainted with the dialects of the people whose customs and folklore he studies. Stefansson was the first white man the sealer had ever seen. Yet he was quite unmoved; he pro concluded that the explorer was an Eski

The sealer turned out to be one of a small tribe numbering all told thirty-nine and calling themselves A-kū-li-a-kat-tāg mi-ūt. Unlike the haif civilized Eakimo with whom explorers have hitherto come in contact the Akuliakattamiut were hon est and kindly. Indeed Stefansson's account of their traits bears but the genera theory that the savage, uncontaminated by civilization is far more tractable, far more hospitable, far more considerate than his more sophisticated codsin who has come into contact with the trading station. No member of the Akuliakattas mint showed any disposition to pry into Stefansson's baggage; no one burst into his hut unannounced; and so far from denying him food, the tribe even supplied him and his men with choice parts of freshly killed seals and huge musk-ox



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Here is a car at \$975 built in accord-ance with the high code of honor which marks the manufacture of the best cars cars far above it in price.

It claims close relationship with those at claims close relationship with those cars—not in size, because it is a car of lesser dimensions, of course—but in all of the ingredients which constitute in-

tegrity of construction It asks to be set apart and judged, not by the standards its price would sug-

gest, but by that more microscopic analysis you would apply were a larger monetary investment involved We have pictured in book form some

of the processes which justify our belief that this Hupmobile is the best car of its class in the world; and we want you to see and read it

We also want you to see and ride in the car—samples are now in the hands of Hupmobile dealers.

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# The Modern Terminal

The wonderful and enormously expensive work that is being done all over the country for the comfort of the people of the cities and of those who travel is the subject of two profusely illustrated articles in the

# October SCRIBNER

The Problem of the Modern Terminal by SAMUEL O. DUNN, of "The Railway Age Gazette."

#### The Gate of the City

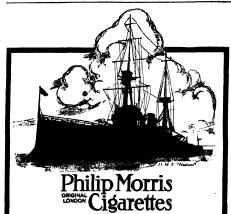
by W. SYMMES RICHARDSON, of the famous architectural firm of McKim, Mead & White.

'No other structures zeros the convenience of such numbers. Rising to the needs of these multitudes, the engineers and architects of American rail-ways are deting the country with terminals surpassing in size, in cost, in the comforts they afford, in monumental beauty, any others in the world."

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horn fiagons filled with steaming seal-blood soup, although their own dogs had no more than half-rations of meat. horn flagons filled with steaming s

People Who Had Never Seen a White

Man.
Like the sealer on the ice in Dolphin and Union Strait, the tribe had never een a white man, or an Indian, or eve an Eskimo from the west. They had heard of other people to the west; but so vague were their ideas of what those people were that Stefansson and his Alaskan Eskimo were taken for brothers.

The discovery of a tribe, completely colated from all civilizing influences, preerving unchanged customs and traditions that are perhaps centuries old, is an event the scientific importance of which can be gaged only by an ethnologist. Perhaps the lay reader can grasp the significance of the discovery if he con siders that when studying the habits of an uncontaminated people it is often pos sible to determine accurately at what period more civilized tribes first adopted implements such as metal knives, at what period they first began to weave baskets and make fish-nets, and at what period the first signs of culture began to appear among them. Sometimes the region from which a tribe originally emigrated can be

Important as the discovery of a people who had never been influenced by white men unquestionably is. Stefansson made er discovery, which is of more popular interest. Shortly after finding the iar interest. Shortly after finding the Akuliakattagamiut, Stefansson discovered on Victoria Land, north of Cape Berley, Eskimos who seemed strangely like north-ern Europeans They called themselves the Ha-nc-rag-mi-fit. Their total number is forty, of whom Stefansson saw seven-teen. How different they were from the row dimercit they were from the usual aborigines of the North may be inferred from the fact that Stefansson's Alaskan Eskimo, who had worked for years on a whiler, said: "They are not Eskimo; they are fo'c'sle men" "Two of them," says Mr Stefansson, chin beards to be described as light, tending to red, every one had light cycbrows; one—perhaps the darkest of all—had hair that curled slight. A few had typically European blue eyes"

The Possible European Origin of a

Strange People.

What is the origin of these Scandinavian-like people? Here is a splead opportunity for the student of heredity who accepts the modern Mendelian views. Are these people simply sports or muta-tions, as the modern biologist classes anomalies such as albinos? Or are they simply the result of an intermingling of north European stock with Eskimo stock? Here is a biological question of the utmost importance, a question that can be answered only after careful study of the physical characteristics of the tribe has been made, both from the authropological well as from the Mendellan standpoint

Assuming that the Ha-ne-rag-mi-ut of Victoria Land are mutants, a study of the people from the Mendelian standpoint might reveal that the earlier, purer type was even more European than its de-scendants Again, it might turn out that there was a direct admixture of Europea blood. Although it is much too soon to venture any hypothesis, and although Mr. Stefansson has arrived at no definite conclusions as yet, it is a matter of much in-terest to ascertain what are the possibilities of a direct mixture of European

In the fifteenth century the entire Norse-Teutonic colony of Greenland, with whom the name of Lief Ericson is historically associated, disappeared. colony's importance may be judged from the fact that it had a bishop of the Church of Rome, two monasteries, a convent, fourteen churches, and over three thousand inhabitants. They were a sea faring people, who had crossed the water to Norway and to America before Columbus had set out to discover Cathay. Door. ments in the Vatican show that th ments in the various show that the colony was in a prosperous condition as late as 1412. Yet, in the seventeenth century Hans Egede found only Eskimo in Green-

The time is drawing nigh when the Panama Canal will cease to be a vision and will become a reality. No engineering work in the entire history of the world is of greater than the property of the control of the property of the world is of greater and engineers have urged the digaring of a waterway which would untie the Facility with the Atlantic.

The Panama Canal is a mountent to American engineering the Signature American engineering the Signature American engineering the Signature American engineering the Signature American will devote to it the Issue of November 9th—the November mid-month number. How they great locks were constructively award to be a supported to the Will award. How the great is essent actin in two to make way for the Canal, how great steam abovels that scoop up five tons of the waterway, and how landelides availanches containing millions of cubic yards—were coped with all its will be told. Our editor. Mr. 1 trip to Panama in order to gather much of the material which will appear in this number. He spent several weeks at the Inthuna, studied spoke with the men who are doing the great work—Col. Goothais, Col. Gorgas, and the rest—and brought with him facts which have not yet when yet and yet and yet when he was not yet and yet a

# The Grand **Central Terminal**

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mande, who will pass through its marble halls with no one to ask them whence they came or whither they go, the state of civiliation's progress and es an engineering work. To Mr. Jules of civiliation's progress and es an engineering work. To Mr. Jules of the state o



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A Jubilee of the Umbreila
ON August 12th it was 200 years ago
that Jones Hanway of London was born, who is credited with being the first person to use an umbrella. When first carried, the latter consisted of whalebone, covered with heavy eliskin, the whole

land and no trace of the Scandinavian blood or language. What became of the colony? Was it massacred by Eskimos? Was it swept out of existence by famine or pestilence? Or did it emigrate in

"The folklore collected by Knud Ras mussen in Smith Sound, by Prof. Boas in Baffin Land and the Hudson Bay Region, and the sum of the evidence secured by our expeditions," says Mr. Stefansson, "seem to me to point strongly to the probability that the Norse colony in Greenlan was never entirely exterminated, but that the larger portion of it escaped, and it is their descendants, mixed with the de-scendants of the Eskinos of their time, whom we now find in Victoria Land. We realize fully that there are several theories that might explain the presence of blonde Eskimos; we merely consider that this is the most probable one."

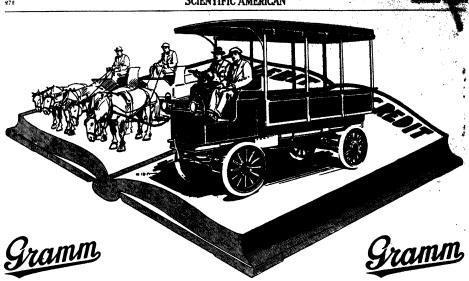
In support of a possible Scandinavian incestry, Mr. Stefansson points out that there are slight resemblances between the language of the blonde Victoria Land Eskino of to-day and the old Norse language. Then, too, the Victoria Land Eskino sluss at least one song, alliterated in the old Norse scaldic style—something unheard of among other Eskinos The literary resemblances between the modern Victoria Land Eskimo and the old Norse-men are, however, not conclusive enough when are, investigated to a Scandinavian origin for the tribe. But taken together with the physical characteristics of the tribe, which will soon be studied on the basis of the measurements and photo graphs that Mr. Stefansson has taken, it is possible that a chain of evidence will be forged, so strong, that what is now tentatively offered only as a mere theory may become an established ethnological In the opinion of Dr. Clark Wissler,

curator of the department of anthro pology of the American Museum of Natural History, Mr. Stefansson has returned to the United States with an amount of material for study that is unusually rich and promising. Mr. Stefansson hopes to prove after he has had an opportunity of studying a large collection of ethnole material that represents the life, customs folklore not only of the hitherto unknown Eskimos of Victorial Land, but of the known tribes that inhabit the region about Point Barrow and the northeastern shore of Alaska, that the Eskimos as a whole came from the east along the north shore of the American continent to Alasku It may turn out that the Eskimotraditions in regard to certain important events, such as the chronological sequence of the founding and abandoning of vil lages can be relied on for longer period than ethnologists have hitherto assur Thus, it may become possible for Mr Stefansson to show with sufficient accuracy just when Eskimos first reached the mouth of the Yukon River or whatever with people of another race. So, too, the archeological relics that Mr.

Stefansson has brought back may show that such arts as pottery-making and basket-weaving are far more ancient in Eskimo culture than anthropologists have supposed. It seems reasonably certain a present that Mr. Stefansson's archeologi ork extends the known area of th use of pottery over a thousand miles east of Point Barrow, which was by many con sidered the eastern limit of the knowl edge of the art.

The expedition has brought back speciness of what may prove to be rich iron ore from Victoria Land, north of Cape Bexley. Copper is picked up almost any-where by the natives of the whole Corona-tion Gulf district, each family having itfavorite place to search for knife and





# On which side of the ledger is your hauling department?

Is it a credit to your business or does it stand out as an ugly debit? Does the old out of date horse and wagon come up to the high business standard and maximum efficiency you are trying to maintain?

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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, OCTOBER 5 1912

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10 CENTS A COPY

# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, OCTOBER 5, 1912

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Munn & Co., Inc., 361 Broadway, New York

The Editor is always gind to receive for examination illustrated articles on subjects of timely interest. If the photographs are sorry, the articles durit, and the facts cutheritie, the contributions will receive special attention. Accepted articles will be paid for at regular space rabes

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Good Crops and Good Times

MONG the many prophets who have lately been predicting a return of business prosperity there is one whose voice speaks with special authority. We refer to the Agricultural Department at Washington, whose recent announcement that the crops throughout the United States promise to be of unusual abundance will do more to stimulate confi dence in the business world than any official announce denote in the banness world than any official annual comment that has emanated from Washington for many months past. Not that the Agricultural Department has made any definite prediction of a revival of business, for that does not come within its province; but it is so generally understood nowadays that thriving agriculture is the basis of general business pro-perity, that the announcement of a "bumper" crop ha come to be taken as equivalent to a prediction of a erous year.

The estimate of the probable crop for this year presents an imposing and encouraging array of figures. The wheat crop, which is estimated at over 700,000,000 bushels, should bring to the farmer over \$000,000,000. The corn crop, which is estimated at nearly 3,000,000,000 bushels, has a farm value estimated at \$1,350, 000,000; while the value of the oats crop, which wil reach the highest figure in the history of our country, or 1.290,090,000 bushels, is not far short of \$400,000,000 Adding to this the value of the crop of rye and bariey and the other multitudinous farm products, it is estimated that the value of the products of our farms at present prices will be over \$7,000,000,000. Not only does this vast sum benefit the farmer by swelling his bank account or by enabling him to lift his burden of mortgage, but the moving and disposal of the crop will bring proportionate wealth in other directions; to the railroads for transportation, and to the steamship companies for carrying the surplus abroad; to the owners of the elevators, a vast indus-try in itself; to the owners of the huge mills that turn it into flour, and to the buyers and brokers who bring producer and consumer together.

Nor does the stimulus of plentiful crops end with

the mere matter of their sale and distribution. The farmer himself becomes a large purchaser of agricultural machinery, and the general improvement of his farm by the construction of new buildings, the construction or renewal of fences, to say nothing of the purchase of automobiles and additional luxuries for his home, not only directly stimulates business in a wide variety of trades, but, indirectly, reacts strong ly in stimulating that revival of credit and confidence which is essential to any lasting prosperity.

#### Theory Modified by Practice

S the result of his experiments with the whirling table. Langley demonstrated that the for Ing table, Langley demonstrated that the for-ward portion of the wings of an aeroplane is more efficient than the after portion, and he showed that, other things being equal, the greater-the length of the lending or entering cise in proportion to the area of a plane, the greater would be the efficiency. In other words, a long and narrow plane would be more efficient than one that was short and deep. Bas-ing their conclusions upon this theory, many writers predicted that, as speed increased, the planes would

approach to their proportions the long and narrow wings of fast-flying birds such as the albathons. As a matter of fact, the progress of the last few years to recipe matchines has shown a tendency to shorten the length said despent the width of the plans, a tendency which was particularly noticeable in the cup at Okleago. The reason for this departure from cu) at Omerge. And reason for this objecture recon-theory is that for structural reasons the shorter and deeper wing is found to be preferable. For a given area and weight, the more compact the machine, the stronger it will be. Bending stresses, tending to break the wings are less, and the head resistance also is reduced—the guy wires being shorter and the whole In reduced—the guy wires some snorrer inno case wance system of trussing presenting less area and head resistance. Langley's law still stands; and the proportions of the racing monoplane of to-day aimply prove once more that theory is ever greatly modified by practice.

#### Again the Question of Pier Extension

Again the ejection of Fier Expension

Agg year it was the White Star Line and this year it is the Hamburg-American Line that is petitioning the War Department for a permit to add one hundred feet to its piers at the port of New York, in order to accommodate its latest and largest passenger ship. The "Imperator," which was supposed to be 900 feet, and we are now informed by the Vice Director of the company is 919 feet in length over all, Director of the company is 919 feet in length over all, is due at this port next spring. The longest pier of the Hoboken docks of this company is 880 feet in length or sevenity to sighty feet less than is necessary to give accommodation, with proper clearances, for the new liner. When the White Star Line had its hearing before the War Department it was urged in reply that the granting of the permit for a 100-for addition would not be any mean settle the ones. foot addition would not by any means settle the ques-tion of encroachment upon the North River fairway; since even larger ships would probably be built in the The predicted increase has occurred, and once more the Board of Engineers of the United States Army are confronted with the problem of reconciling the apparently conflicting interests of the owners of these big ships and of the owners of the lesser craft which

make use of the Hudson River.

The Board of Engineers, whose duty it is to protect the rivers and harbors of the United States against encroachment by private interests, have always shown a commendable seal in the fulfillment of this tru To say that at times they have erred on the side of caution and have been perhaps a little too reaction ary, is distinctly to their credit; for the State and Federal interest in the preservation of our rivers and harbors is both large and permanent; and over and above that are those vast commercial interests, whose urgent demand that the harbors and waterways of the country be so safeguarded as to promote the greatest good of the greatest number cannot be gain

with regar rd to the particular case of the Hudson River, it will be agreed that if the proposed extension of piers into the fairway will impair its use-fulness as a great artery for waterborne commerce, the lengthening of these piers, however greatly it may be demanded by the exigencies of any particular steamship company, should be strictly forbidden.

But will a moderate extension of the piers work any serious injury to the Hudson River? We very much doubt it. As a matter of fact, after over a year of service, the 100-foot extension of the White Star Line pier has failed to show that it has been detrimental to the river, either by causing swifter currents, or by acting as an obstruction to traffic up and down the Manhattan shore line. For this reason, among others, we believe that the extension of the Hoboken piers should be permitted, and this, not merely in the inter-est of the particular company now affected, but of shipping at large, and of the port of New York in

In any discussion of this question there is one fact which must never be forgotten, namely, that there will be an inevitable growth in the size of future steam-ships. This increase is guaranteed by the fact that, ships. This increase is guaranteed by the fact that, other things being equal, it costs less to carry a ton of freight a given distance in the larger than it does in the smaller ships. Parseagers, moreover, can be transported with greater comfort and with less distances from the motion of the sees. Ships will grow larger, not smaller; let us be sure of that; and if, because of the lack of accommodation, the large ships of the future cannot come to the port of New York, they will go to those harbors where they can be necommode ted

The que stion, then, narrows itself down to this: Are we willing to sacrifice a little of the width of the Hudson River at New York in order to maintain our position as the leading port of the Atlantic seaboard? position as the seeming port of the Atlantic sendourly. The argument in favor of pier activision is strength-ened by the fact that in comparison with the large sports of the ward, New York, in respect of the width of its fairway, is the most favorably attunted of al.. Thus the clear width of the Thames at the London docker is 600 fisst only? Ekzeleng and Me ishoet 1,200 fisst; the Thanses, et Thisse tonly 7,200 fisst; the Thanses, et Thisse tonly 7,200 fisst; antwelpy 7,200 fisst; and focks of Liverpool have only from 2,000 fisst; and between coposite inferinated lines. As on this, the Ruddon Sirver at its instrument clear width of 2,800 feet; and even if the test to added to the Ruddon pier, there we clear width of 2,840 feet betwe

The Scientific American would be the ental to traffic; but in view relating to other great ports of the wor reating to other great ports of the worsess the proper compromise between length width region of river has yet to be reached; the limit of pier length will be found to be and 1,050 feet, according to the location.

#### Pipe Galleries

T is a strange anomaly that in this scheme, and particularly in practical America, the tinual tearing up of streets to lay, repair nect up pipes and wires, has not been supplied. the practice of putting underground structure as galleries. The inconvenience of the constant and disturbance is apparent to every one, and the mass of present methods has been forcibly polaries again and again. Nevertheless, nothing arranged as a constant and again. has been accomplished in America in the way ing municipal pipe galleries.

It is true that the frequency of street opening in have been reduced, and that public service tions are not allowed to dig whenever they without the formality of even a permit. More fore new pavements fore new pavements are now laid down, in many entire it is more often the custom to require corporations as do in advance any substantial construction or repairs which may be needed, in order to postpone as long as possible the first breaking up of the new pavement. And yet, sooner or later, the breaking up process begins

The most extensive placing of underground struc-tures in galleries is, of course, to be found in Paris and London, the sewers being used in Paris, while in London the County Council has constructed pipe gal-Jonuso the County Council has constructed pipe as there under a number of new streets. The trouble in America has not been due to a lack of study of the subject; for the best-designed galleries actually planned anywhere appear to have been those proposed by the late Rapid Transit Commission for the subway in lower Broadway, New York. These galleries, it may be remembered, had seven separate divisions, with the electric ducts of the street railway company in the center, chambers for pipes on each side of the street, and separate ducts for high and low tension conductors, also on each side, with separate manholes conductors, also on each side, with separate manholes for each class of wires, and distribution passages from manholes along in front of buildings. Long openings for handling plues and wentlation were also provided, and it was a great seeback to the progress of street engineering when the idea of building the galleries, based on the New York type, were suggested for Hoston, when the Washington Firest and the best which the Washington Firest and busy are proposed, but nothing the second progress of th ing resulted beyond the plans.

The chief reason for the failure to build the lower Broadway galleries was said at the time to be a difference of opinion as to what city department was to have charge of the galleries, and unfortuntely the difference of obtains as to what city department was to have charge of the galleries, and unfortunately the completion of the subway could not be delayed for the settling of the question. In Sooton there were several objectors. The municipal engineers con-suited wanted their pipes slower the subway, while the railway company objected to any construction which would lower the station platforms a foot more than was absolutely necessary. The city engineer, movewould lower the station platforms a root more man was absolutely necessary. The city engineer, hove-over, objected to any placing of pipes, water, sewer, or gas, in an open galler, no matter how well designed, on the ground that the character of municipal em-ployees had so destricted that it was unaste to place the maintenance in their hands of pipes in a common

gallery. While it is well to err on the side of safety before raking radical changes, there appears to be ample testimony that the plening of pipes in galleries would make for greater safety instead of greater danger. In the London galleries, large size mains are found close to electric light cables, and yet no explosions here cocurred; whereas gas mains briefed under streets here cocurred; whereas gas mains are forcets have caused constant explosions in different cities.

The first American city which will make a real be-

The first American city which will make a real be-ginning with pipe maleries, will be performing a great public service. A block or two would be better than a nothing; but what is done should be well done or say at at all. For a bealty constructed or posety maintained a gallery majet, but the cause more than it kelpted. It is greatly to be bound that the public service occupyed, tone will see the advantages or going size well-neger lated municipal galleries, tanked of paymen, that pipes and writer in the pre-scale inglanced better.

with Quarte Lampa.—To show by poorly Chicago is lighted, a group of the plant in the property has installed six quarte-tube mercury—a a block of Randolph Street, 320 feet the same of 5,000 candle-power and but might at an annual cost of sixty-nine

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foot

tric Car.—On the Enkoping-Hoby line of the railroad there is now running a new earlier and electric car which carries 40 which carries 40 miles the Diesel engine which being which were well adapted for this purpose and south beautiful to the Diesel engine which well a suppose and south beautiful to the relation of the purpose and south beautiful to the relation of the purpose and south beautiful to the relation of the r The restrict of the restrict of the second o

With the Aid of Wireless Telegraphy government is engaged upon plans for the these telegraphy in mapping colonial regions, being a colonial region. It is well known that a very carried can thus be obtained for the difference in regular courses and the best of the difference in specific on thus be obtained for the difference in the specific course of the specific

Wireless Telegraph Outfit for Aeroplanes. -- The new Franciers army aeroplane is commencing to make flights in order to test the new wireless outfit that has been d upon it, and some good results are expected. The ratus is of the latest Marconi construction and is made up into separately contained units so as to permit istributing its weight, as may be found necessary. A rial unspillable accumulator is employed. The only high-tension wire on the aeroplane is run in a well-insu-lated tube through the fuselage of the machine, so as to med against shocks. The trail wire has a safety-breakguard against shooks. The trail wire has a safety-break-ing plug which releases the wire at once when pulled not by any object on the ground. For the ground-receiving station an improved portable wireless post is used which can be erected in a few minutes.

Heating a Church With Electricity.—A successful in-more of electric heating for a large church is seen in the Season of electric meaning for a large course is seen in ten-ses. Schelduler Church at Nuremberg. Individual heaters are used in each pew so that a good distribution of heat results. This is done by mounting a long tube heater mear the floor in front of the seat and along the back of mean ton moor in rout of the seat and along the back of the following pew, which acts as a foot warmer. The electric heating tube is a 3-inch fron pipe which contains a smaller tube wound with resistance wire. At each pow is a switch for outting out the heater, and all the separate as a winten for cutting out the neater, and an tea separate wases from the heaters run to connection boxes placed at different points under the floor. A perforated iron foot metr runs along above each heater. The church has a cent-ing capacity of 1,200, and the length of pows is 1,750 feet

Electric Cars for the Suburban System of Paris Electric Cars for the Suburban System of Paris... Preparatory to carrying out the project for using electric tenins on the extensive west suburban system of Paris, the railroad company is testing a new passenger motor car which will probably be used. It is now running on the Paris-Versailles electric line. For the suburbs it is desired to adopt a system of frequent and short trains as in the subway, and these will be made up of trains of two or several motor cars and perhaps trailers. The new car has double trucks, each one fitted with a 250 hores-power metor, making 500 horse-power for the entire car. It tor, making 500 horsé-power for the entire car. It kes 50 miles an hour on the level. Trains are made up with a motor our stand and intermediate motor ours or trailers, using the multiple-unit control method. Such m have sente for 100 nameangers At some hours a single e can be run, and at others 6 to 8 cars.

see can be run, and at others 6 to 8 cers.
Wholese Telegraphy in Bellvia.—Bollvia is the latest of the South American republies to adopt wireless telegraphy, the government having unleved into a contract of the south of the second of the seed of the section of the second of the sec

Mark and the control of the control

#### Aeronautics

The fellowing unique advertisement appeared re-cently in a Hanover (Germany) paper: "Lost, from an aeroplane, gold watch and chain; was last seen disap-pearing in large stack of rye on a field near Ulsen. Liberal reward for return of same.'

osed Long-distance, Hydro-aeroplane Flight A Paris to the sea flight for hydro-aeroplanes is being discussed by the Aero Club for next year, and the pre-vailing idea is to make it a river and sea event, that is Valing ince is to make it a river and see event, that is the flights will take place over the Soine from the city to the Channel const at Denaville, the well-known wastering place. Then the flyers will make over-sea rose of vari-ous kinds in the Channel region. At Deanville it is greatly desired to promote an event of the kind, and a losal committe is now formed, headed by Prince Murst and Senator Heart Deutsch. and Senator Henri Deutsch

An Aeroplane for Vertical Movement. No. 1,037,278, a St. Louis man, John R. Martin, presents an aeroplane in which a segmental rack is carried by the plane and a gear carried by the car suspended from the plane and a gear carried by the ear suspended from the plane is meshed with the rack and the plane may be shifted from a vertical to a flying position. A propeller is carried by the plane and is suitably driven and m are provided for operating the steering device so that a single propeller may be employed to lift the entire machine from the ground in a vertical course to a flying position and may then propel the machine in flight.

Piying Boats on Lake Leman.—During the present season's tests a number of hydro-scroplane flights are bloing made on Lake Leman. Recently the Swars pilot, Grandjaen, on a monoplane of his own design with a 50 horse-power Octilion motor, won the Eyand prate of \$2,000 which was founded in 1000 under rules made by the Swits Avisidion Chile. Grandjaan made the flight the swiss Avisand Cliff. Grandpain make the might over the lake from Chillon to Versoix, near Geneva, with stope according to the rules at Ouchy and two other places. He thus holds the princ, but this can be competed for up to December 21st of this year.

Hunting with Aeroplanes.—Hunting of game by aeroplane is likely to become one of the sp piane is likely to become one of the sports of the ritter, and in France several of the pilets are becoming adepts at this kind of chase. Moreau is one of these, but the lately met with an accident which however is not very serious. He had been invited by the Mayor of Varennes, section. He had occur inviews by the reason of varieties, market his high part in hospining of the fall hunting season, and was flying near the ground, when a shot fired by an imprudent hunter struck him in the eye. But he was soon able to make a landing and received medical aid at once, so that probably he will not be laid up for more than two weeks.

Long Distance Conduit Pipe for Hydrogen.—The newly opened sirship harbor at Frankfort, Germany, has along distance main for hydrogen, the first of its kind in Germany. The gas comes from the chemical factory "Elektron," of Griesheim, 2½ miles away, where dairy own 855,000 to 708,000 cultor feet of hydrogen are obfrom 635,000 to 706,000 cube feet of hydrogen are ob-tained as a hy-product, which formety was allowed to escape into the sir. This quantity would be sufficient to escape into the sir. This quantity would be sufficient to the amount of gas that can be piped to the terminal as the Frankfort is 36,000 cubic feet per day. On account of the length of the piping bad to be wedden together by the ength of the piping bad to be wedden together by the ength of the piping bad to be wedden together by the ength of the piping bad to be wedden together by the autogenous process. The gas is conveyed to a gas holder of about 212,000 cubic feet capacity, from where it is led through subtervanean pipes to the cement flooring of the arithip hall. These pipes terminate in 18 shafts from which connection can be made with the individual gas colls of the sirehin. cells of the airchir

winen connection can be made with the individual gas cells of the airship.

A Military Berman Bighane.—A very interesting test was made by Henry Farman with a new aeroplano, which is designed for army use, this being a munisture biplante having a total spread of 30 fees, but it can be folded up within 7 minutes, so as to have but 10 feet width. The body of the acceptance can be taken apart and packed likewise. M. Farman set out to make a practical flight with the screptane in the neighborhood of Paris, and left the Chalous camp at 8 o'clock in the evening with the iddes of alighting near the city and of proceeding with a ragid dismounting of the flyer, so as to transport it quickly by road. This he was able to do very well, and he slighted in a very rough plowed field in the subwebs. Aided only by a farmer, he ragidly disassambled the machine and sweated an automobile, which then towed find dismounted biplane back to town at full speed so that it could be pisced in an automobile garage. Thus it was shown that the Farman biplane can be handled very quickly in this way. On the flight it made as a verage speed of 75 miles an hour, and at the start it rose to a beight of 300 feet in 50 seconds. This new biphase of Permars is fitting-with a 75 horre-power Gnome morec. On a previous test at Chalous, it carried on board 450 pounds of genealine together with the pittic and one passenger and made 70 miles an hour. It could be pisced up for treapport in 7 minutes and 15 and one passenger and made 70 miles an hour. It could be passenger and mapport in 7 minutes and 15

#### Automobile

Early Self-starter.—That the self-starter is not new, is shown by the record of one American company manufacturing air-cooled cars. As long ago as 1902 a Syra-cuse man, John Wilkinson, owned a motor car, equipped with a motor starter of the compressed air type.

One Way to Stop the Cut-out Flend .- Finding it next to impossible to prevent motorists from opening the next to impossible to prevent motorists from opening the muffler cut-out and emitting flatling gun explosions, the Columbus (O) City Council is considering a bill which would cause all muffler cut-outs to be sealed by a city official, for a fee of 50 cents. If at any time or place a car is found to have this seal broken or damaged, it means a fine—no further evidence being required.

Veracity and Value of Police Evidence.-- A British lawyer whose client was arrested for speeding questioned the evidence given by the polecoman, claiming that the man was incapable of judging speed or distance. He asked the officer the width of the courtroom, and re-ceived the answer "20 feet." The room was over 30 feet wide! The court subjected him to a test of time and the answers fell so far short of the correct, that the accused

An Odd Engine Starter.—The problem of satisfactorily starting a gasoline engine has been attacked from a new point of view, the apparatus being somewhat similar to an old-style "priming attachment" Screwed into activative cap is a small reservoir which contains gasoline. Into this gasoline dips an electric filament which receives its ourrent from a battery, through a starting switch When the current is switched on, the filament is heated and gasoline vapors are forced through a tube into the cylinders

eyindees. Reckless Use of Gasoline in Cleaning.—The acmo-of recklessness appears to have been reached by certain mean an allow pubble garage recently. Too long to use the more tedious method of sashing only articles with soap and water, they improvised a passione garage, with which they started cleaning gress-covered machinery. As night have been expected, the entire garage was some converted into a grant carbineter, the mature created by the gasoline vapors and the atmosphere within the building finally exploding with terrific force.

The Passing of the Horse in Cities.-Time was, and that not so very long ago, when the first thing the rela-tives of a sick person did was to cover the street in front of the house with straw so as to deaden all sounds from passing vehicles. The great number of rubber-tired automobiles has made this procaution unnecessary, and instead of the time-honored straw covering, there apinstead of the time-honoral straw convering, there ap-peared a big sign at each street crossing near the "house of sickness," on which this sentence was painted in big letters. "Don't hout! Illness!" Concedent with the appearance of this sign in Kensington, London, the London Duty Mirror published a trenchant edi-torial on the foolshenses of taxing automobiles for the use of city streets. "The horse is a danger and a missance in the streets of a large city. We hear a lot of motor-car street taxes, but it is the horse which should be taxed, not the motor car. The horse is unlayering, crafte and street taxes, but it is the horse which should be taxed, not the motor car. The horse is unhygienic, erratic and occupies too much space. Tax the horse as you would dogs, and leave the motor cars alone!"

A New Speed Indicator for Automobiles .-- A new speedomotor-tachometer of the hydraulic type has re-cently been introduced in this country from Germany, and while it is suitable alike to all manner of vehicles its chief interest naturally centers around its applicability to automobiles. It consists mainly of a three-cylindered pump, submerged in oil and actuated by a flexible shaft coupled to the front wheels. The rapidly revolving shaft causes the pump to force oil into a fourth cylinder, mounted alongside of the pump, in which a piston rises or falls according to the quantity of oil in the cylinder. At falls according to the quadrativ of oil in the cylinder. At the bottom of this evilande is a small orifice which per-mits the oil to return to the pump. The top of the piston is connected through a goar and lever system with a recording hand, and with a tape recenter on which all evitroniums routions of the piston and toolheid disk recorder are printed together with the time of their over-rences. The recorder works in the following manner: As rence. The recorder works in one concerns, the speed of the front wheels increases or decreases, a covering the above-mentioned oil orifice is close or opened more or less, thus permitting varying quantities of oil to escape and controlling the rising and falling of the piston. The smallest rise of the piston is greatly amplified by suitable gearing, so that the recording band describes an arc of a circle sufficiently large to be easily recognizable. Interposed in this gearing and forming part of the transmitter as dask face with a number of pins at certain intervals. When the piston rises the disk turns, and as soon as the spassi exceeds a certain arbitrary limit, contact with the pin at that point causes the type recorder to act, and an imprint of the time and of the resorter to act, and an imprint of the time and of the excessive speed is made. In addition to these ordinary performances the recording device can be arranged to record every movement of the steering wheel, the brakes, the clutch, etc., so that a complete record can be kept of the entire movements of the our and driver, which might prove of extreme importance in cases of accident.

#### The Vacuum Cleaner in Cotton Mills Modern Methods Applied to industrial Sanitation

IN the earlier days of the industry cotton spinning as an occupation was notorious for its permitous effects upon the health of the workmen. The air in the shops was inden with fine dust of cotton there and other funding particles decived from the raw material and the surroundings, and this heliap breathed in day after day by the workmen, gradually choked up the improvement of the internations of the lungs was a typical occupational disease of cotton syntheses. And, indeed, a look at the last of the illustrations accompanying this article shows clearly enough the danger lurking in the cotton mild disease of cotton syntheses. The cotton fibers—none too destrable introducts, For it this inderophotograph we clearly discern not only the cotton fibers—none too destrable introducts. For it this inderophotograph we clearly discern not only the cotton fibers—none too destrable introducts. For its its declicate the oversion of the content of the internations and wounds, favorite points of attack for the tubercle bacilities.

A particularly harmful operation in the cotton mill is that of "stripting" the cardine engine evidence, which is performed three or four times daily on each machine. In this procedure a cloud of dust is raised, which diffuses itself through the work-room, usless presentionary measures are adopted. One of the first improvements introduced was to place ventilating fans a satisfable points, which drew the sir, and with it some of the dust, out of the room and discharged it out of doors. But evidently this is at best only a poor remedy for the condition combated. With the development of modern methods has come a new system which is a vast improvement a suction conduit leading from a hood over the stripping machine to the exterior. The hood is placed close to the point at which the pernictions dust is raised, and, in fact, incloses the stripping brush, so that the removal of the floating particle is practically complete. The principle employed is essentially that of the vacuum carpet sweeper. The entire stripping brush is inclosed in a portable hood, connected to a vacuum exhaust tube.

At first sight it may appear that the addition of such a hood and conduit to the stripping brush would add not inconsiderably to the burden of the workmen who have to curry the brush from machine to machine. The old type of brush weighted from 8 to 50 pounds As a matter of fact, by careful attention to the material employed (aluminium) I has been found possible to make an entire brush and hood with an aggregate weight not executing 60 pounds.

round possible to make an entire brush and nood with an aggregate weight in ot exceeding 60 pounds. There are several types of vacuum strippers. In some the dust is collected in a canvas bag, while the fiber is "stripped" from the brush separately nother form of muchine both fiber and dust are sucked oft together, and the dust is then separated out by filtration. An idea of the nature and quantity of the dust thus collected and the fiber recovered may be obtained from one of the accompanying libratations, in which A shows a basket filled with the dust, and B the corresponding valuable fiber recovered

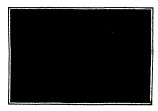
#### A School for Traction Engineers

In the February 10th issue of the Scientific American an article appeared entitled. "Making the Tractioneer" This article gave to the reader an idea as to what is being done in the line of education of operators of farm tractors.

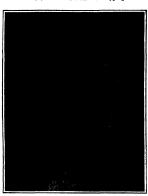
Since the appearance of the article in question is new institution has been organized, which aliam to aperialize on this type of education. The institution is known as the Indiana School of Tractioneering, and is necessary to the appearance of the present of the presence of the presenc

At present courses are offered in gas engines, powerferming, and agricultural valuetering. The first course covers the operation of all types of gas engines. The power-farming course gives helpful suggestions on the best methods of applying engines to farm work with definite instruction on the operation of the various farm inplements. The course in Agricultural Engineering takes up such important subjects as farm buildings, gallot, the use of concrete on the farm, farm machinery, farm lighting systems, heating and ventilation of farm buildings, water supply systems, drainage and irrigation, and road building. It covers engineering subjects which are of special importance to the farmer.

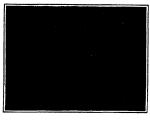
Instruction is given by means of residence, correspondence, and traveling courses. The residence course is maintained at LaPorte, Indiana. Instruction in this school is given by means of lectures and recita-



Useless dust (A) collected in the bag, and valuable fiber (B) recovered from the stripping brush.



Vacuum stripper at work on the main cylinder of carding engine.



View of stripper, showing hood inclosing one of the stripping brushes and connected to a vacuum pipe.



Microphotograph of stripping dust. Note the sharp angular fragments as well as the cotton fibers.

tions and by practical work or engines machines. Arrangements have been advanced students in the school may their time in a tractor factory in the setting and inspection of engines.

A correspondence course is offered are unable to attend the residence will be given in our acception in the same and the same are such instruction is given in our account and entered the second will be maintained to give the requiremental and the spondence course. This school will visit spondence course. This school will visit as sufficient number of correspondence rolled within reaching distance and given the instruction which can be such as sufficient number of correspondence models and working machines. It is the substitution of the

This part of the school's programme is but it promises well to solve the question of schools to the door of the student who smalls to get away for an extended course at a residue administration.

#### Sesame Culture in the Southern Mintes

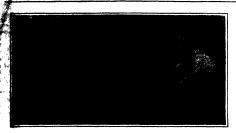
CS ESAMD or benne plant (Scommon overdists Ement) is a native of India, and is now being cediments the nearly all tropical and send-tropical regions of the world. The plant is a hairty, sticky annual, about themselved the plant is a hairty, sticky annual, about themselved the hairty of the service of the

The 'Inited States Department of Agriculture is now conducting experiments in the Nouthweet, and the results thus for attained show conclusively that in many parts this crop will richly report for planting. The next step on the part of the department officials is to find a market for the crop, and they are now endewing to Interest the confectioners to use the oil, which is at present obtained from Markellie in France, when the greater proportion of the commercial oil is on-

The chief metit of this crop is that it requires very little cultivation of the soil. It is sown in shallow drills usually from three to four feet apart and about welve inches apart in the rows. Sowing takes place as early in the spring as possible. In the southers states it requires from the first of April to June for the crop to ripen, but the plants are left in the field the country of the

abundance of yellow, mild and bland oil called "gringlity" resembling oftwo (in solutined from the gringlity" resembling oftwo oil in obtained from the sea an adulterant of oil of seasonomic veffer, out; second to exceannt oil in the variety of its uses. It is employed for cultuary pasposes, food, medicine, commetice, liminisation, intrinsicion, scapmanting, set C free oil is also used in making a very attractive confection, being used like peaning a very attractive confection, being used its peaning a very attractive confection, being used its peaning a very attractive confection, being used in making a further like of the confection of th

The demand in the United States for gingelly of in constantly increasing, and although the price of the seed is rather low there is undoubtedly a Tavorship opportunity for developing seasure culture in the Scottlein States. In case of the production on a scale larger than it is at present it would soon become an economical quantion, and the price of both seed and old would increase in value.





A trip to town for a bolt takes little time.

A sack of feed fits on behind.

#### The Motorcycle and the Farmer By J. M. Palmer.

MOTORCYCJÆ he a luxury to the city man, but to the farmer it is both a luxury and a business necessity. After the chores are done he can get on his meachine, go to town in fifteen or twenty minutes, go to the theutor, or spend the overlain at the club or park, and not have to put in three or four hours on the road behind the family ping. The motorcycle needs very little care: is inexpensive to operate, and is a piece of machinery that every farmer who can afford it should have.

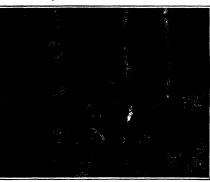
Leaving out the pleasure side, the motorcycle is very useful on the farm in making quick trips to town Maybe the housewife finds that she is going to run short on greenvies for dinner. It is only a matter of half an hour to make a trip to town and get the needed supplies. Suppose it is during the wheat harvest and the work is rushing; a boil or casting is broken and the whole crew is thrown out of work. You can make the trip to town on your motorcycle, get the needed part and have the machine in running order in less than an hour, while if you had to hitch up the family horse and make the trip it probably would take half a day. A motorcycle is very handy in case of emergency. Speed in getting the doctor or some medicine has saved many a life.

Every motorcycle should be equipped with a luggane-cartier. With one of those at lead of claft or nine hundred pounds may be carried. One carrier may be attached back of the seat and another in front of the handlebars. In this way a motorcycle may be used in making butter deliveries in town, and taking vegetables and other products to market and exchanging them for groceries and other necessities. A chair attachment may be used on the front of the motorcycle and a luggange-carrier on the back. Two persons can ride then, for pleasure or business.

some can ride then, for pleasure or business. Some persons who own motorcycles use them to rut the washing machine, churn, cream separator, and other farm machinery. A bot is attached from the rear wheel to a fiywheel on the machine. This is using a motorcycle to a great advantage, but according to r motorcycle expert it should not be used for running machinery. A motorcycle engine is made to be aircucied, and this will not be properly accomplished unless the machine is in motion. The angine should not be run mone than three minutes, standing still, or be platen may begin to stick. The guard must be



Taking the cream to the station is a small chore.



It means a quick trip for groceries

removed when belting it up, and on some machines this requires considerable time. The machine must also be held stoady or it will throw off the belt. This is usually accomplished by means of a rope. If the beltromes off it may get mixed up with the wheel, causing considerable darages. A motorcycle cuclius will not do its best work unless it is running at about 1,000 revolutions a minute, and this is almost too fast for the average piece of machinery. Some arrangement is needed to reduce the speed. A counter-shaft usually is used for this purpose.

It is not a paying proposition to use a valuable

motorcycle engine to run machinery, when a stationary engine can be obtained for a low price to do the same work. In other words, using a motorcycle engine to do this kind of work is like using a fine driving horse for the heavy work on the farm.

#### The First Storage Battery Train

THE United Railways of Cuba have cardered an electric storage battery train for use on a line running about one hundred miles out from Havans. Hereforce, this line has operated a rain consisting of a steam becomotive drawing a single conch. In its place a train consisting of three cars equipped with Edison storage batteries will be used.

A test of this train was made last week over the Long Island Buffroad, running from the Pennsylvanin Station to Long Beach, a distance of about twenty-five miles. The train was equipped with the multiple unit control; in other words, the separate motors on the cars are operated by a shade controller Each car is equipped with 26 cells of Edison battery, furnishing 200 voits to the motors. The cars are mounted on double trucks and each car carries four motors. The cars are mounted on double trucks and each car carries four motors. The tarks are sent suffix-five feet and five lineless in length and are provided with four double sents and four end seats having seathus accommodation for forty-two mesoners.

The twenty-five mile trip to Long Bench was covered in fifty-seven minutes on the trip out and fifty-five minutes on the trip out and fifty-five minutes on the return. When Long Bench Long 18 not have reached, the lantferles were reclurized from the third rail of the Long 18 aland Raitreads system, the time of recharding occupying twenty minutes. When the round trip had been completed it was ascertained that the train had consumed four kilowatts per train mile, which at the rate of one cent per kilowatt amounted to 2 seventy minutes.

for the entreies is from 60 to 100 miles for seven hours

of charging
The great advantage of this form of battery is that it may be recharged at frequent intervals at far above the normal charging rate. This periodical recharging rate or partial charging is known as "koosting." For instance, in Washington a car is being operated over a four-infe line, covering this distance in different minutes. There is a delay of three minutes at each certainal, which is occupied in changing the fenders and giving the conductor an opportunity to reset his



Storage battery train with multiple-unit control built for the United Railways of Cuba.

register. This three-minute period is sufficient for recharging the batteries at five times the normal rate, with sufficient energy to carry it to the other terminal. The car covers 204 miles per day and the battery is not charged at any other time except during the stope at the terminal.

As the Edison storage battery is of a very rugged character and practically fool-proof, no trouble anticipated with the operation of the storage cars in Cuba. As to the life of the batteries, no figures can be given at the present time for the reason that no batteries of this type have been in service long enough to determine their full life. Batteries have been used for six years without showing any material deprecia-

The cars in which these batteries are installed are of a very different construction from the ordinary railroad car. The main object has been to reduce weighth as far as possible. The same principle has been empiosed in their construction as in the car described in our issue of February 5th, 1910. The design was developed by Mr. Raiph A. Bucch, who assisted Mr. Edison in adapting his stronge battery to traction.

#### A 7,500 Horse-power Pelton Waterwheel

The realization of the fact that the sources of the supply of nitrogen, upon which saimal and vegetable life so largely depend are strictly limited, and that the consumption of nitrogen compounds is growing at a heavily increasing rate, has led to a close study of the means of increasing the supply of nitrogenous compounds.

The most promising and certainly the most lavish source, from which draw nitrogen for the manufacture of the greatly-needed compound, is the atmosphere, and this branch of the nitrogen industry is growing at such a rapid rate that it promises to become, ultimately, one of the largest in the industrial world

The same natural conditions of an abundant supply of hydranile power, which caused the first plant for the fixation of ultrugen in the United States to be the fixed on the control of the several plants in that country, the most interesting is that which utilizes the Riukan Fall, which consistence in the control of the several plants in that one of the control of t

Five niles below the dam another dam forms the trake for the power station, and from this tanke the water is led through a tunnel to a reservoir formed at the brow of the cliff near the Rjukan Fall. The tunnel is 2d indies long and has a descent of one in 300. A thousand fret below the terminal reservoir of the tunnel is the power station, which is located on a shelf in the face of the cliff. The water is led from the reservoir on the momental side to the power station through ten large flumes, placed side by side. The tunnes are the feet in diameter, the upper sections being built of rivoted steel plate, the lower sections, where the pressure reaches 400 pounds to the square luch, are made of welded plates one fuch in thickness. The water descends 971 feet to the turbines. The effective height after deducting losses through friction, etc. is 300 feet.

After leaving the power station, the water enters mother tunnel excavated in the side of the cliff and extending 31 miles down the valley 11 there enters another series of flumes, through which it drops 909 feet to a second power house, which is a duplicate of the one mentioned above

The upper power bouse is completed and the lower one is now under construction. In the Venuer power bouse, as it is easiled, are ten units each of 15,000 horse-power, with a maximum enjactity of 17,000 horse-power. But he maximum enjactity of 17,000 horse-power. Each unit condition of two large Petiton waterwheels, installed side by side on common shorf, upon which are mounted also dustice generators. A three-phase, alternating current of 50 periods is transmitted from this power house to the ultrate whis, through stay wires, partly of copper, but chiefly of aluminium. The working votage is 61,000. The Petiton waterwheel, which is very extensively used in the mining districts of the mountains of our Western States, is particularly adapted to very high pressures and relatively, issual volumes of water. The early wheels were small and were run at extremely high velocities; but of late years it has been recognized that this type of wheel can be built in larger sizes and run at rates of revolution, which render it possible to differencement.

it o generators of large size operating at moderate rates of speed.

At the Rijukan installation the water is delivered in two jets of high resocity. It strikes on the raised center of high resocity. It strikes on the raised center of the cups (see front page illustration), and is deflected to each side, leaving the cups in a direction which is tangential to their outer edges. The direction of motion is changed nearly 190 degrees. Themeetically, the velocity of the jet, and in this case the efficiency of the wheel would be 100 per cent. There is a loss of efficiency, however, due to the friction of the water in the cups and the energy loss due to the loss of velocity of the water as it leaves the cup. In well-designed wheels of the larger sizes, however, the efficiency has been carried up to shout interly per cent.

# The International Rubber and Allied Trades Exhibition

THE International Rubber and Allied Trades Exhibition was formally opened at noon on September 23d, in the Grand Ceutral Palace, New York city. An enormous amount of raw rubber was exhibited, the value of which is estimated at about \$400,000.

value of which is settimated at about evaporain a felictously worded speech, Commissioner Calvin Tomkins, who represented Mayor Gaynor, dwelt upon the importance of the rubber industry to America.

"Feer since the rubber industry as we know it began to develop with the discovery of vulcanization," said Mr. Tomkins, "kmerica has been the principal user and manufacturer of rubber. To-day we use more than one half of the total production of the world's raw rubber, and in value the output of the fullshed product could see the world's raw rubber, and in value the output of the fullshed product could see the value of acte production.

"In this great and representative exhibition two things especially will strike more people: first, the flux nucluinery, mostly American, which is employed either in working the rubber in the earliest and crudost stages or in utilizing it in its inhabed forms for all sorts of purposes, from howe to overshoes, from tires for automidies to toys for the universy, from deep sea cables to flooring, such as that over which those attending the exhibition will wait when entering the bail. The second striking thing is the rivally—a perfectly rivalry, but a very serious rivalry—which exhibits for premier position in the market between what is called will rubber and plantation or cultivated

Finall is the bone of rubber. Without the distrees of the Amstern forest, which for centuries have been yielding the previous milk from which rubber is made a mightly industry would have been impossible. It was not to be a milk to be the substitution of the trivairy. Thirry-five or thirty-six years ago some them trivairy. Thirry-five or thirty-six years ago some them the substitution of the results of the accessful genuination of these seeds has been so remarkable that within a couple of years or so from the present time, the output of plantation rubber will probably be at least as great as that from Brazil.

"As the world's consumption of rew rubber bids fair to exceed one hundred thousand ions a year-apart, that is, from the enormous quantities of reclined rubber which are used every year-we have here a very interesting situation, which is being watched with eager attention, not only in Brazil and in the East, but also by the manufacturing markets of two continents.

by the manufacturing markets of two continents. 
"Rubber has become indepensable to the progress and civilization of the world. Great scientific minds are decoting themselves to the clutdation of the many problems it opens up. The inhoratories of Europe and America are engaged in a caselesse round of experiments, both as to the character of the rubber and the uses to which it may be put. Some day we are even promised rubber roadways and silent cities. The support given to this exposition has been world wide. Twonty governments are represented, and among those who are taking part in it are the Philippiness and the Hawnian Islands. I understand that there, are one hundred foreign delegates to the Rubber Conference which is to be held in connection with the exhibition—experts in rubber growing, rubber chemistry, and rubber manufacture—who, will contribute addresses and papers, the value of which cannot be over-estimated."

# The International Congress of Hygiene and Demography

ACCORDING to the official estimate fully ten thousand persons witside the exhibition is consciously with the international Congress of Hygiene and Democraphy on Reptember 22d. The exhibits are essentially popular in character. Tables, Glagrams, mottoes concerning the use of slooked and the trouble resulting from it; the nature of various diseases, and the measures that should be taken to prevent infection or contagion are extriking features of the exposition. Boy

wouts will give regular-hourly drills, athlatic cless and exhibitions of methods of medicals as injured persons, is ecoting, in edensity of There is a municipal bething pool wide, will be for the water events. An area of approximately, ty acress will be used for the various compa ascess. More than one thousand children from a playground associations will participate in play contests.

Every day there will be practical demonstrative treatment of like patients and dummies will be desurded operations. Every organ, muscle and his surded operations. Every organ, muscle and his and bone in the human body is represented if dummies. There is a model field hospital equivalent which is said to be the finest of its kind in the game of the control of the c

The Congress itself was opened by President
The address of welcome was made by Dr. Max

ner, of Borlin.

When the roll of nations was called, delegates from the roll of the roll

#### Types of Aeroplanes for Military Service

U NTIL further notice, the intention of the Army aviation service is to purchase and use only two types of aeroplanes.

One type will be known as "Speed Scout" aeroplane. This type is desired particularly for strategical recommissance, carrying only one aviator without passenger, and having a radius of operation of about 100 miles and a speed of not less than 65 miles per hour. With this type of aeroplane a military aviator is expected to locate and report large bodies of troops. This machine should be capable of ascending at the rate of about 500 feet her minute.

The second type will be known as "Scout" machine. It is desired for recommissions exertise when hostilic armies are in contact or approaching contact. This service requires a weight-carrying accorplane, the crew constituing of two aviators, capable of relieving each other as observers; the accreptance about the provided with radio equipment. This type of acceptance about a wind remain in the air at least three hours to permit the observers to locate smaller hoties of trough accurately upon a map, make sketches, mullitary photographs, etc. The Scout acceptance should have a speed of not less than 45 miles an hour; the maximum speed must not exceed 60 miles per hour. It should be capable of currying a method weight of 450 pounds, and with this weight ascend at least 2,000 fowt in 10 minutes. The chassis must be designed so that it is capable of ianding on and arising from soft ground, such as harrowed felds.

#### Porous Metals

U SING an alloy of lead and antimony, containing op per cent lead, and one of tin and lead, containing 80 per cent of tin, Hannover has obtained both porous lead and tin. The porous lead thus obtained may be used for many purposes, and would be especially valuable in making accumulator plates of very large capacity.

#### The Most Costly Percelain Service

AT an exhibition of works of art, at present being facilities the first present being facilities which is considered the most costly in the world. It consists of 36 hand colored plates. This set has an estimated value of 38,000 rebiles (31,560); archies plate, therefore, being worth 1,000 rebiles Deviced.

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e emilion une not responsible for statements e in the b Anonymous comtions tomos be considered, but the names endints will be withheld when so desired.]

#### The Columbia River Jetties

The Belitor of the Schemetere American: in the Schemetere American of August 24th, 1912, on page 160, is an article headed "The Harbors of the Phelito Coast." In this article is a statement regarding the thin necessary to complete the project for a deep-mater sutrance at the mouth of the Columbia River, which has been very harmful to this port, and which ween as oeen very nammu to tas port, and whom is to fix from the true facts, that we have asked the United States engineers to furnish a correct statement of the matter, a copy of which I am inclosing. We would sak that you publish same in at least as promuent a position as was the article which it is proposed to PORTLAND CHAMBER OF COMMERCE,

By EDMOND C. GILTNER,

Portland, Oregon.

Secretary.

[We take pleasure in publishing the following letter of Major McIndoe. Mr. Ballou informs us that the statements in his article were based on the last annual report of the Chief of Engineers, U. S. A .- EDITOR. Edmand C. Giltner.

coretary, Chamber of Commerce,

Portland, Oregon.

1. Referring to your letter of September 12th, 1912, inclosing a clipping from the Schmertific American incursing a relative to the jetties at the mouth of the Columbia River. I wish to say that I read the article about a week age and made note of it with the intention of writing to the Editor, calling his attention to the erroneous statements published in the paper prepared by William Hoses Ballo ou, Sc.D.

2. Instead of only about 19,000 feet of the south setty completed on the first of June, 1912, this jetty was practically seven miles long and nearly compl was practically seven miles long and nearly completed, the only work remaining to be done at that date being the completion of the groins, extension of jetty apron, and the filling up of some low places, which work should be entirely completed in about six working months. Instead of 'twelve years to complete the present south petty,' it is condidently expected that it will be com-pleted in the early spring of 1913, and that its main-tenance will not require the dumping of more than a small amount of rock in the next few years, while the treatle remains serviceable. treatle remains service

3. The proposed north jetty, instead of being two thirds as long as the south jetty, is only a little over one third as long, and should not cost more than one one third as long, and should not cost more than one half the amount expended on the latter. Instead of sixteen years to complies the north jetty, as stated by Mr. Ballou, a most liberal estimate would be six years, so that Portland can hope for the full depth which the jetties will give across the bar in about seven years instead of "usent-eight years." Preliminary work for the north jetty, including construction of receiving what, storage yards, etc. is now well made. it is hoped that dumping of rock in the north can be commenced during the summer of 1913. Within one year after the construction of the north jetty is begun, it is expected that its effect on the bar will be

begun, it is expected that its effect on the bar will be noticeable by increased depths, and that this increase of depth will continue with the advance of the jetty work until the desired 40-foot channel results.

4. During the fiscal year ending June 30th, 1912, the best channel remained fixed in position, the survey completed in June, 1912, showing it to be almost exactly in the same position as in June, 1911.

(Signed) J. F. McIndon, Portland, Oregon.

Major, Corps of Engineers.

#### The Flight of Projectiles

To the Edifor of the SCIENTIFIC AMERICAN: An article on the flight of projectiles by Rear-Admiral N. C. Twining, U. S. N., appeared in your issue of August

He states that a projectile must move nearly point on are never that a projectile must move nearly point on throughout its flight, owing to the fact that restantion from the resistance of the air is less toward the end of its flight than at the beginning, which could not be if the projectile traveled more or less sidewise toward the end of its flight.

He states that the point of the bullet deviates farth

He states that the point of the bullet deviates farther from the trajectory as the range hereases, and that this increased deviation causes drift.

That is, according to the first contention, the point of the bullet deviates no mice, and probably less, from its icajectory toward the end of its flight than at the beginning, whereas, isoerding to the second contention, the point of the bullet deviates more from its trajectory toward the end of its flight than at the beginning.

These were contentions contradict each other, and one are than the about the bullet.

we contentions contradict each other, and one

He compares the twist of a baseball to the twist of a bullet. This comparison seems wholly visionary when it is considered that a baseball is rotated on an axis more or less at right angles to its trajectory, whereas a projec-tile is rotated on an axis practically identical with its

trajectory.

I offered some years ago to demonstrate to the authoriis outered some years ago to demonstrate to the author-ties of Canada, Britain, and the United States as well as to numerous manufacturers the cause of drift and other things, and to point out how shooting, especially with small arms, could be very much improved with little or no increase in cost, but no notice was taken of the offer.

I could not get opinions from any of these people con-erning the flight of projectiles.

The article in your issue of August 17th seems to emonstrate that little or nothing is known concerning the flight of projectiles by those in a position to make use

Red Deer, Alberta.

#### Another Card Puzzle

To the Editor of the SCIENTIFIC AMERICAN:

I have read with interest the description of the "four I have read with interest the description of the "four island" earl puzzle in a revent issue of the SCIENTIFIC AMERICAY and it recalls another card puzzle which I will now describe. Let a preson take a pack of cards, remove the joker, and then lay out three piles, lapping the cards of each pile one upon the other so that the denomination of the lower or initial eard of each pile can be seen. In placing the piles, count from the initial eard up to ten, then if the initial card be a six, count on that seven, eight, moe and ten or four cards just as they come from the pack. If the initial card of the second pile be a seven, place on that cards to count cond pile be a seven, place on that cards to count up to ten, or three eards, and if the initial card of the third pile be a five, it will require five eards to count up to ten. The game is for the player without seeing the three piles to tell the sum total of the spots or numerical values of the three initial cards, the party placing the piles to give the player the balance of the deck after he has placed the three piles. This sum over after he mas proced for turne pines. This sum total the player can readily determine by subtracting nineteen from the number of eards in the balance of the deck handed him by the party. In showing the puzzle the player can stand with his back to the other party when the cards are being placed in the three piles, and while the explanation of the trick is sumple. pies, and while the explanation or the trick is simple, it is at first mystifying. The face cards can be given any desired number value in playing the trick, care being taken that the value so given is the same in starting the eard piles and in calculating the total values of the initial cards

OBSERVER.

Washington, D. C.

#### The Bureau of Chemistry

To the Editor of the SCIENTIFIC AMERICAN

To designate the methods of the Bureau as "un tifle" is not fair, as it is not in accord with fact. chiefs of divisions, the laboratory chiefs, and the labora tory asistants, one and all, are men of high educational qualifications. All are university graduates, and many of them have done considerable graduate work. Furthermore, most of them have had considerable practical ce in the study of food materials in field and ry. The Referee Board does not and cannot check up the work done in the several United States food and drugs laboratories. This Board is authorized to investigate and to report upon certain problems under dispute. The Board does not in any way direct or con-however, that for a few years more, the Board will be a

You make certain allusion to differences of opinion between interested manufacturers and those whose duty it is to enforce the law. My dear ar, every manufac-turer of foods and drugs, even though he knows that the articles manufactured are useless and harmful, will declare most emphatically against the findings in the pure food and drug laboratorics. These interests will very naturally oppose anything which hurts their business. charge of incompetence against the Bureau is not sord with the facts we already pointed out. The analysts in the laboratories are not only highly qualified, but they are scientifically honest, knowing full well that mpt to "prepare cooked-up evidence," would be discovered in the several "checks" to which rtainly be discove certainly be unsorvered in the several "onesia" to which every analytical laboratory report is subjected (by laboratory chief, division chief, chief of bureau, and check analyses).

It is indeed much to be regretted that crooked manu-

facturers with money enough to fight in the courts have time and again diverted and annulled the ends of justice. We are all satisfied that nostrums and fake remedies should not exist, and the manufacturers thereof should be punished under the law. It is true some have been brought to time, but not all. We would indeed be pleased to be informed how these offenders may be more generously and more expeditiously punished. The Bureau is doing all it can.

You criticise the division chiefs in the Bures special reference to Bigelow, Kebler, and Doolittle.
The last one named has been "acting chief" of the
Bureau since the resignation of Dr. H. W. Wiley, and in e capacity of mere "filler in" he has been doing remark-ly well. Bigelow and Kebler have done many years ably well. of most efficient work, their ability, honesty, and integrity have never been questioned. If they have often failed to bring wrong-doers to justice, the fault has, as a rule, not been theirs, which brings me to my closing

 The Bureau of Chemistry is sordy in need of older, more experienced, better qualified assistant U.S. district attorneys. In fact, the administration of the Pure Food and Drugs Act calls for attorneys having special educa-tional and experience qualifications. The Bureau has time and again lost cases simply because of the ir ency of the assistants assigned to the cases by the U. S. District Attorney.
2. The Bureau must not have in its personnel anyone

who is not heartly in sympathy with the enforcement of the spirit of the Pure Food and Drugs Act. This should apply to all divisions of the Bureau, inclusive of laboratory assistants. This has not been the case in the past, as all informed persons know.

3 For some time to come the Bureau should center its efforts upon the flagrant transgressors and bring these to time. This will keep all hands busy for say ten to fifteen years. Afterward we can take up the minor technical offenders

4. The Bureau will no doubt welcome all help and good The Bureau pays no attention to knockers.

San Francisco, Cal. ALBERT SCHNEIDER [Our correspondent is not familiar with the conditions in the Bureau of Chemistry.

in the Sureau of Chemistry.

He is wrong, for example, in assuming that the chiefs
of divisions are men of high qualifications. Mr. Bigelow, for example, is not regarded by scientific men as an
authority on food chemistry. It is impossible to find
any authoritative work of his which would entitle him to serious consideration as a physiological chemist. We have no question that he is an honest and zealous official; but we do question his scientific competency to pass upon very important and very novel questions that involve the health of ninety million people. Dr. Kebler is a graduate of Michigan University and of the George Washington University He has never performed any research work of the character which would entitle him to be regarded as emmently qualified to hold the import-ant position that he does. Moreover, in the Chattanooga trial of the Coca-Cola case, it appeared that in experi-ments conducted under his direction, rabbits had been drowned instead of poisoned (as he supposed) by run-ning a tube down their lungs instead of their stomachs. That is sufficient evidence of his scientific incompetence Like Mr. Bigelow, we have no doubt that he is honest and zealous, we simply doubt his scientific ability.

Mr. Doolittle was once State analyst for Mich MT. Doubttle was once state analyst for Michigan. The appointment was made in the face of very hostile criticism; for Mr. Doubttle's competency was very much questioned. He has never done original work of such a character that scientific men regard him as an authority on physiological chemistry or the chemistry of

We agree with Mr. Schneider that there are many mer in the Bureau of Chemistry whose educational qualifica-tions are high, who have done remarkably able work in their special fields and who may well be regarded as true scientists. But the trouble is, under the present administration, it is impossible for these men to do effective

It is true that the Referee Board does not and cannot check up the work done in the several United States food and drug laboratories. But the Board does and can check up disputed matters. The benzoate of soda inves-tigations were made by a medical student who had not even an M.D. He graduated from an institution which oven an M.D. He graduated from an institution when Dr. Abraham Flexner of the Carnegie Foundation for the Advancement of Teaching considered poorly equipped for the purpose of imparting medical instruc-tion, and the discontinuance of which institution Dr. Flexner strongly recommended. Naturally, when men like Dr. Remsen repeat the experiments on a larger scale and with greater scientific care, the result is quite Referee Board in the benzoate of soda and other cases? If ever there was a shining example of scientific incomce, we find it in the manner in which these benzoate of soda studies were conducted. It would be absolutely unnecessary to maintain a Referee Board if the Buresu of Chemistry did its work with the scientific care that we right to expect from a Government institution h has unlimited funds to spend

se with Mr Schneider that interested manufac We agre We agree with Mr. Schneder that interested manufac-turers will do all in their power to evade the Pure Food and Drugs Act. Our point is that they find evasion particularly easy because of the incompetence of the Bureau of Chemistry.—Entron.]



Captain and officers of the "Pat-terson," flagship of the Fourth Group of torpede-boat destroyers.

# Landsman's Log Aboard the United States Destroyer "Patterson"—I

By J. Bernard Walker

The present series of articles is a record of impressions authored by the Editor, on a week's crusse aboard the destroyer "Patterson," during the summer manouvers at the eastern entrance to Long Island Sound.



Through the signalmen and the wireless the flagship sees, and talks with the first

T was a faultless July morning when we took a motorboat at the docks at Newport, Rhode Island, ran around the breakwater which extends from the island on which the torpedo station is located, and drew alongside the gangway of the United States destroyer "Patterson." Looked at from the water, the great length and generous freeboard, and particularly the lofty fore deck of the vessel, combined to give an im-pression of power and seaworthiness which was very convincing. From the filmsy "boat" of twenty to -five years ago the torpedo craft has de into the "ship," strong, swift and seagoing. The impression was deepend as I stood on the main deck and took in the long sweep of her, from the break of the forecastle to the taffrall at her stern; and again when I went forward and entered the comfortable officers' quarters below the forecastle deck.

an alleyway on the starboard side terminated in the captain's cabin, a commodious room extending across the ship, where I received a cordial greeting from Capt. John M Luby, commanding the fourth destroyer group. Aft of the captain's cabin, on the p side, are three officers' staterooms, in one of wh the writer was most comfortably domiciled. Aft of writer was more see is the wardroom mess comfortable seating accommodation for four at the ding table Adjoining this, to port, is the officers' galley. At the break of the forecastle are two 3-inch semi-

automatic guns, one on each beam, the forecastle struccut away so as to permit these guns to fire dead ahead. Amidships on the main deck, one on each beam, are two twin 18-inch torpedo-tubes, mounted so that they can be swung through a wide are by a man who, seeled above the tubes, with his eye at a tele-scopic sight, trains them with great accuracy upon the target by means of a wheel not unlike an auto steering wheel. Amidships on the main deck is ansteering wheel. Amidships on the main deck is another 3-inch gun, and astern are a third twin torpedotube and a 3-inch automatic gun. Forward on the forecastle deck is yet another 3-inch gun, making in all five of these effective pieces.

elow the main deck are storerooms, berthing spaces for the crew, the two boller-rooms, each containing two oil-fired water-tube boilers, the turbine-room, additional berthing space for the seamen, the quar-ters of the petty officers, and astern of all the doc-

tor's stores and other gen-

While we were wait-ing for the signal to weigh anchor and proceed to sea, the writer took the opportunity to gather a few particulars of dimensions, etc., and incidentally receive an impression of the ship, particularly in regard to that remarkable light ness of construction of construction which we have all come to associate with the torpedo boat and the de-stroyer. The "Patteris nearly three hundred feet in length over all, or to be exact, two hundred and ninety-four feet Her molded depth from main deck to keel is sixteen feet; draught, eight feet;

beam, twenty-seven feet. The main deck is about nine feet above the water line, the forecastle deck seventeen feet above the same level, and the bridge about twentyfour feet. The ratio of length to beam is one to eleven; a proportion which will enable the reader to understand how extremely fine are the lines of these nomenal craft. The complement of the "Patterson four officers and eighty-five men, and her normal dis-placement is about seven hundred and sixty tons. She is driven by turbines operating three propellers, and on her trials she indicated about 15,000 horse-p and attained a speed of slightly over thirty-three knots.

My first impression of the destroyer as the result of that half hour's inspection was of the thoroughly workmanlike appearance of the ship, due to the absolute ence of anything of the ornamental. It is true, she exhibited all the characteristic orderliness of a naval while; but there was everywhere evidence that a tor-pede-boat destroyer is designed for arduous and dangerous service, and built with a sole eye to securin maximum efficiency for every pound of material and

terson" is the combination of lightness and strength in her construction. Remembering that she is about three hundred feet in length, and that the bending stresses tending to break her back when she is being driven into head seas, must reach a very high figure, it is astounding to learn that her keel plate is only 5/16 of an inch in thickness, her garboard strake and mainde stringer 1/4 of an inch, and that the rest of the plating on sides and deck is 3/16 of an inch in thickness only. Equally light is her framing: 3-inch bulb angles for the frames, with deeper, 9-inch web frames at every twelve feet of her length. Considerable trans-verse stiffness is afforded, however, by the eleven watertight bulkheads, which assist in holding the hull to shape. Also, it must not be forgotten that a series of deep longitudinals runs through the bottom ship, while the main deck is immensely stiffened by two 12-inch I-beams, worked along the inner edge of the main-deck stringers, and two 18-inch I-beams, which extend through two thirds of the length of the ship on side of the boiler-room and engine-room he Enough has been said to show that these

sels are of astonishingly light construction; and the fact that the "Patterson" went through that terrific three days' gale, early in the year, when the Atlantic three days' gale, early in the year, when the Atlantic fleet was on the way to Gauntanamo, Cuba, without the slightest sign of structural weakness, speaks volumes for the excellence of the design and the high character of the workmankin of these very fine boats. But the dasplip has made signal to get under way, and going up on the bridge, we learn what are to be the measurement of the days of the structure of the workman of the structure of the days.

the maneuvers for the day. A fleet of eight battleships is leaving Newport Harbor for the open sea, although the harbor is known to be blocked by a group of nine the narror is known to be blocked by a group or mine submarines, which are cruding off the entrance to the harbor, well outside the range of the shore batteries. The battleships are to steam out in column pro-tected by a screen of nineteen destroyers. At present, our destroyer fleet in commission consists of four groups, with five ships in each group; although on this particular day we have but nineteen boats available. the "Warrington" being still at Newport News, having a new stern built on to replace the one that was cut off

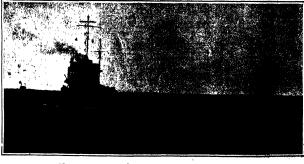
the water water of the place the one that was the one by a sailing schooner during a gale of wind last winter.

The duty of the destroyers is to form a screen entirely around the fleet, the boats steaming at such marine slipping by without being sighted will be re-

uced to a minimum.

As we left the harbor, two divisions, or nine boats, forming the van, led the way in wedge-shaped forma-tion, being distant two or three miles shead of the leading ship of the battleship line. A mile or so to ard, steaming on a parallel course, in line ahea was a group of five destroyers. An equal distance to port was our group, steaming also in a parallel column formation, with the flagship "Patterson" in the van. As we reached the mouth of the harbor, the leading groups, being on divergent courses, gradually opened out their distances from one another, until they were spread over a wide reach of the Sound in fan-shaped formation, the boats being at a distance, say, of a mile and a half from each other. The speed of the fiect had been raised to fifteen knots, and as we drew out beyond range of protection by the shore bat-teries, a keen lookout was kept for the tell-tale pariscopes of the submarines, which, seen at a distance, look no larger than a

pair of lead pencils. There was a long and rather heavy swell roll-ing in from the sea, and as we changed course. taking the sea on the broadside, I saw some of the most extraordinary rolling on the part of the destroyers that it is possible to imagine. The easy bilge and generally fine form of the underwater body of these boats and the disposition of weights are such as to conduce to quick motion and an extreme angle of roll. Even in the moderate sea that was run-ning, the "Patterson" ning, the soon commenced to swing from twenty-five to thirty degrees each side of the perpendicular. This, I was informed, was moderate in 4989a



"Our group went through a series of evelutions which displayed the facility and accuracy with which these craft are handled."

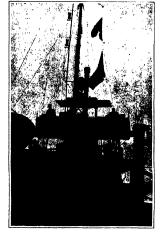
to what these are capable of for manager weather, the section of t

specified druing the excessive rolling of the greatimanary storm was somewhere between twenty and specify-diving the excessive rolling of that, ye hadsmen, whose experience of the ses is confined to the slow and says motion of a forty-thousand-ton ocean Beer! I had heard, and could now well believe, that a destroyer is one of the most uncomfortable of bosts, and that a gale at sea is a heavy strain upon the splaced andurance of those on board. The motions are splick, constantly changing, and frequently unexpected for moment, not even when lying down in a bunk to santch a badly-needed sleep.

Nevertheless, to the honor of our naval officers let it be known, that there is no service so popular as the torpedo service. Certainly there can be no branch of the service which affords such splendid experience and training for those younger officers who, later, are to become the captains and admirals of our larger ships. The hele sweet formulative one their wines the con-



"From the flimsy 'boat' of twenty to twenty-five years ago, the torpedo craft has developed into the 'ship,' strong, swift, and seagoing."



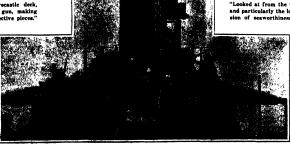
Bridge from main deck, showing signal flags on right and Ardois electric lamps on left for day and night signalling.



"Forward, on the forecastle deck, is yet another 3-inch gun, making in all five of these effective pieces."

plicated mafreuvers, many of them carried out on the derivent nights, without a light showing on any one of the fiet, call for the quick eye, tho steady hand, and swift deciden, a vidence of which I was to see, a day or two later, during the night maneuvers.

But to return to our story. Somewhere in that wide stretch of tumbling sea sheed and on either fank of the far-faung screen of destroyers were the nine submarines—not gathered is any well-esheed group, but hall prob-



"Amidships, on the main deck, are two twin 18-inch torpede tubes, mounted so that they can be awaig through a wide are by a man, who, seated upon the tubes with he ope at a telescopic sight, trains them upon the target by means of a hand-wheel."

ability scattered as as to make their attack from widely separated points. The bright sun of the morning had disappeared, and sky and sea presented a monotone of dull gray, relieved only by the occasional broken crests of the heavier seas. To the inexperienced eye of the landsman, it seemed as though the detection at a distance of so small an object as a submarine, even if she were running awash with deck and coming tower exposed, would be a matter of pure luck; and when I remembered that the little craft were all of them.

by this time fifteen feet below the surface, and taking curreful note of the position, course and speed of every one of our inheteen scouts, and that they were doing this at the slight risk of showing only the tops of their sender perfacepes above water, it seemed as though our task of discovering, and if possible slniting these little fellows was one of insuperable difficulty. But the lookouts are special men, choson because of their quick eyesight: and the readiness with which they picked up' the submarines with the naked eye was surriving. If the submarine could only see through the water,

If the submarine could only see through the water, defense by a screen of destroyers would be hopelese; but in making an stack on a moving face it is absolutely necessary for the submarine to thrust its perisonle cyss show water occasionally, both to take note of the movements of the enemy and to correct its own course; and I saw shouch on that afternoon to be satisfied that a far-flung screen of destroyers is a most efficient protection for a battleship face—at least when it is in motion—against this most drawded of all forms



"Looked at from the water, the generous freeboard and particularly the lofty fore deck gave an impression of seaworthiness that was very convincing,"

of attack. Just here, it would be well to point the moral that one of the greatest needs of the United States Navy today is an adequate fact of destroyers. It has come to be accepted among the leading may a powers that for every battleship there should be fout destroyers. How far our Navy falls below this mark is shown by the fact that atthough we possess a total of thirty-seven harticaships bulk, building or authorised, we have at present only thirty-seven a destroyers (concluded on puge 887).

## The Heavens in October

#### Recapture of the Tiny Planet 1911 MT.

By Henry Norris Russell, Ph.D.

EASILY first in interest among the astronomical manouncements of the past summer is the recapture—if we may so speak—of the very remarkable asterold known as 1911 MT.

The history of this little body has afforded quite an stronomical romance, which nearly turned out, as has

been well sith to be an astronomical tragedy.

On October 3d, 1911, Prof. Pulisa of Vienna, a distinguished observer of the minor pianets, while observing another object, noticed that one of a pair of faint stars in the field of view of his telescope had changed as position resultive to the other. A few minutes measures showed which one was moving, and made it clear that an object of unusual interest had been discovered; for the new asteroid was moving rapidly southward and castless.

The little planet was almost in opposition to the Sun, and when in this relative position, practically all the known planets and asteroids seem to move westward. They are all really moving custward, it is true, around the Sun; but the custward motion of all previously known planets (except Eros near perihelion) is slower than that of the Earth, so that we leave thom behind, and they seem to move toward the west.

benind, and they seem to move toward the west.

The news of the discovery was spread abroad by telegraph, and on the following night another observation was secured by Pulisa, and two by Pechule at
Copenhagen, but then bad weather set in; the Moon came along and made the sky too bright to see faint stars, and, after she had gone, the new planet was lost, and could not be recovered, though photographs of the region in which it might be expected to be, were taken with powerful instruments.

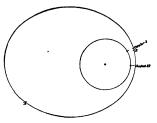
So the situation remained for several months. The existing observations of the asteroid were confined to exacting observations of the inverted were commented to two days, and did not afford enough material for the computation of a reliable orbit by the ordinary meth-ods. However, an attack on the problem was made by Mr Haynes of the University of California, using cer tain very powerful methods of calculation developed by Prof. Leuschner of that university, and he succ in getting an approximate orbit, which was published

last April From this an approximate ephemeris of the planet's tract was calculated, and, when this was available, images of the planet were found on three plates taken at Greenwich on October 11th, and on one obtained at Heidelberg on October 17th These images were faint, and had previously en overlooked, but were approximately where to

search for them.
With the aid of these
observations, Mr Haynes
has computed a second and much more accurate orbit, and an improved search ephemeris Thanks to this, the planet has been identified on a plate taken at Heidelberg in the middle of September, and one on October 18th With this Interval of a month between our extreme obcan be obtained, and it is possible that still more ob servations may turn up, for the planet was well placed in the northern placed in the nothern sky, and fully as bright as at discovery, all through August and September, and more images may be found on plates exposed for other purposes to the proper region of the sky.

The orbit of this remarkable member of our solar system is shown in the companying illustration. is remarkable for its great eccentricity, which exceeds that of any previously known planet. When nearest to the Sun, it is but 110,000,000 miles from him, and about 19,000,000 but 110,000,000 miles from him, and about 18,000,000 from the Earth's orbit, while its greatest distance from the Sun is 368,009,000 miles, and its distance from the Earth may reach 459,000,000.

The orbit is inclined nearly 11 degrees to the plane



Orbits of the Earth and Planet 1911 MT.

of the ecliptic, crossing it at the points marked A and B in the figure, so that when nearest the Sun north of the Earth's orbital plane, and a little farther

rom our track than the diagram would indicate At the time of discovery it had just passed as the Earth as it could possibly come—as the figure shows, by giving the positions of the two bodies on October 3d, 1911 (the discovery date) and on August when the planet was nearest the Sun. planet's motion in this part of its orbit is actually planer's motion in this part of its orbit is actually faster than the Earth's motion, which accounts for its apparent eastward motion in the sky. As the two swung farther around their paths they rapidly separated, which caused a steady decline in the apparent early lost.
This little planet must be one of the vi

office so far known to astronomical obs discovered, at a distance of only 28,600,000 mile us, it appeared to be of the twelfth magnitu spite of the very favorable conditions. If in oppoat its average distance from the Sun, it would e hundred times fainter, and of mas tann one number times names, and of seasons hardly visible with the great Yerkes telescop accessible photographically with the most instruments, if its apparent motion were as n remotest from the Sun, its magnitu When remotest from the Sun, its magnitum, even the Earth was most favorably placed, would be 12: so faint that, even if fixed in the heavens, it could photographed only with the great Mount Wilson factor; and, considering its motion, would be bey

even its powers.

It can probably be observed only when in the needest third of its orbit to the Sun, and then only when the Earth happens to be on the same side of the Sun at the planet. According to Mr. Haynes' calculations. the planet. According to Mr. Haynes' calculations, it should return to its perihelion in October, 1915; bill observations covering only two weeks give but a sisable observations covering only two weeks give but a sisable and it may be necessary to keep a sharp loading out (photographically) on the planet's track for months around this date.

months around this date.

The actual diameter of the new planet can only be estimated by comparing the amount of hight which it reflects with that which we would receive from Mars or Mercary at the same distance; and in this way it may be estimated that it is only three or four miles in diameter, a mere speck compared with the extent of interplanetary space.

The curious name of this little body deserves exple currous many of the planation. When the discoveries of asteroids became numerous, fifteen years or so ago, they were provisionally denoted by letters, A, B, C, etc., the assignment of names and of permanent numbers being reserved until reliable orbits could be calculated. alphabet was soon exhausted; then pairs of let-ters were used—AA, AB,

ters were used—AA, AB, to AE, BA, BB, etc. Two or three years ago this arrangement ran out; and then it was decided to begin again with AA, but to prefix the date of discov-ery. Hence, the present planet is called 1911 MT to distinguish it from one with similar letters in the earlier sequence, discov-ered some years ago, lt will probably not be long before it receives a per-manent number and a

The principal astron month will be the total eclipse of the Sun on Oc-tober 10th, which is visible in a small part of the southeastern United States as a partial eclipse just after sunrise. The track of total obscuration begins in the Pacific, off the coast of Nicaragua, crosses South America from one point in Ecuador a little north of Oulto to one ir Brazil a little south and west of Rio de Janeiro, after which the whole course is lost in the South Atlantic. The greatest ob-servable duration of totality is about 1 min ute 50 const. It is to be hoped that weather conditions of this eclipse better than they did last year in this Tonga Islands, when eds almost of

. . . . • ٠ . . . . .

THE HEAVENS IN THE REGION OF PEGASUS AND PISCES

#### Making a Youl Ch By B. F. Albert

you desire a chest or box with a trunk or recess war, you can make the best job by putting your either and fastening up the sides and ends, top totom, by dovetailing or otherwise. With a gage the a line parallel to the top edge and far enough



structing a tool c

own the sides to provide a lid or cover of de The box is then sawed along this line with a rip-saw. This will cut fairly smooth, and a very slight finish along the sawed edge is sufficient to complete the work. If your saw cuts smoothly, merely sandpapering will do in some cases, and you will find the cover to be a nice fit

## Rope-end Hook

By Freeman Weiss

I N making a porch swing recently, the writer had occasion to find a suitable method of attaching the ropes to eyes in the ceiling, something a little neater than the customary bulky knot or loop, and yet able to stand considerable strain. The market provides a "rope-end clip," which is, however, made no larger than % inch in diameter. As in the

case, where a larger rope must be used, the following will be found en-tirely secure, and of very neat appearance:

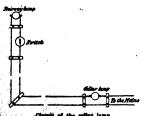
A piece of 1-inch iron pipe (larger or amaller according to the size of th about 5 inches long is cut off and thread-ed on one end. Two ¼ inch holes are drilled on diameters of this piece, at right angles to each other and about an inch from the ends. For these, two pins are made, long enough to reach through the pipe and allow for riveting over at each end. A standard pipe cap to match the pipe is then drilled through the center to a trifle larger size than the shank of the screw hook or eye, permitting it when in place to turn freely. The hook or eye, as the case may require, is then cut off just above the threaded portion, and is fastened into the cap by riveting over the shank. The cap may be screwed on and the rope inserted in the pipe and fast-ened there by means of the two pins, which are then riveted over The accom-

panying illustration, showing a partial section of the completed hook, will make the construction clear. A valuable feature of this device is the swiveled hook, which prevents twisting of the rope. This hook has been tested to over five hundred pounds pull and found

#### Improved Arrangement of Cellar Lamp By Thomas T. McNish, M.D.

THE ingenious automatic cellar switch described by Mr. J. E. Hanning in the Scientific American of April 18th, leaves little to be desired. Some readers, however, may find it difficult to install such a device, and to such a plan adopted by the writer years before the "pull socket" was put upon the market, may be

In the writer's home, as in many others, the cellar-



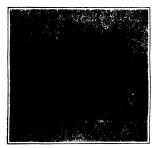
way leads from the kitchen down to a landing, and then behind a partition which shuts off all light from the cellar. At the head of the stairway is a lamp, and below it a switch, which formerly was used only to throw in the furnace cellar lamp, the upper one being turned on or off independently. With this arrangement, the cellar lamp was frequently left burning, and that suggested the simple expedient of joining the two samps in the same circuit. As this circuit carries 108 volts, each lamp is 52 volts. This combination, which is shown in the accompanying sketch, has been entirely satisfactory, as the light from the upper lamp cannot be overlooked.

## Home-made Oil Filters .

#### By Frederick E. Ward

N the home workshop, and especially where there is an automobile to be taken care of, much valuable lubricating oil has to be thrown away when it becomes or dirty or gummy for further use, and yet the quantity is not sufficient to warrant the purchase of an oil fifter. Practically all of this wasted oil could be saved and made as good as new by the use of an inexpensive home-made filter, such as is shown in the accompanying photograph.

A 6 by 8-inch glass battery jar, or other suitable vessel, is provided with a wooden cover having a large circular opening in the middle. Into this opening is of wire gauze or mosquito netting, held in place by a few carpet tacks. When placed over the jar, this serves as a support for the paper filter cone, one of which is shown lying on the table, and cone, one or winch is shown jung on the table, and which, for ordinary grades of machine oil, is best made up of two thicknesses of ordinary light brown Manila wrapping paper, folded carefully so as to avoid tearing. After the dirty oil is placed in the paper cone,



A home-made oil filter.

it takes some little time for the filtered oil to begin to takes some title time to the interest of to sepa-tratus is left to itself for a few days, a surprising amount of clear, pure oil will accumulate in the glass-jar. By the use of paper of a suitable texture, even the hopelessly black and gritty oil wrung out from the waste with which engine drip pans are mopped up, may thus be purified for further usefulness.

#### Workshop Notes

How to Make an Old File Cut Like New .-- When a How to Make an Old File Cut Like New.—When a file has seen its best days and refuses to out, try this little kink: Take a piece of charcoal and rub on the file, just one or two strokes, and then try your file. You will find that it outs much better, and will not elog with filings.-H. D. C.

Making Small Tape. -One of the small but irritating nts to which a mechanic is often subject is the breaking of small taps. In a large machine shop duplicates are generally at hand, but the home mechanic is enter are generally at main, and the nome mechanic is not always so fortunate. A temporary and fairly effi-cient substitute, however, may be made from an ordi-nary fluted drill of the proper size. The drill should first be annealed, then tapered with a fle, threaded with a die of the desired size, and finally restored to BT.-STUART R. WARD.

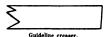
#### Converting Centigrade into Fahrenheit

IN the SCHENTIFIC AMERICAN of September 14th we published an article entitled "How to Correct a Thermometer." In this article formulas were given for converting Centigrade to Fahrenbett and Fahrenbeit to Centigrade. The former formula was incorrectly

stated. It should have been  $F = \frac{3}{5}C + 32$ .

#### Guideline Creaser

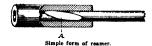
Several, suggestions have been published in these-columns for making guide-lines for lettering draw-ings. In the writer's opinion it is not necessary actually to draw the line—Instead, the tool illustrated here-with may be used. Cut it out of sheet brass, copper,



or tin to the shape indicated, the distance between the points being the distance wanted between the lines. With this tool the drawing is merely creased or faintly pressed, so that after the letters have been made there are no lines to be crased -B F. DASHIELL.

#### A Simple Reamer

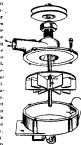
THIS reamer is made by taking a perfectly round piece of steel and beveling the end as shown, make ing as sharp a corner as possible, marked A. It can be



backed off a little on the round side, starting a little from the edge marked A. Then it may be tempered in the usual manner -A F B.

#### Circulating Pump for Gasoline Engines By A. F. Bishop

THE pump shown in the accompanying en-graving is adapted for use on gasoline engines either of the automobile type or of the marine type. The construction shown represents the work of an amateur who upon a very efficient de-The pump is of the centrifugal type, as indicated by the arrow. The eter and the bucket wheel 3½ inches in diameter. The shell is bored out to allow the wheel to revolve freely. The design of the ma



the Unstration, and the Home-made circulating numn parts are drawn in prop-er proportion, so that it should be a simple matter for

others to copy the construction

## Electric Speed Indicator

By B. F. Dashiell

ASIMPLE speed indicator may be made by anyone as follows. On a suitable base mount two gear wheels, B and D. The wheel B should have 100 teeth, and D should have 110 The latter should mesh with a pinion C having ten teeth and soldered to the wheel B. On the periphery of wheel D solder a pin to form a contact point adapted to engage a spring contact at each complete turn of the wheel. In this way an electric circuit is closed through a sounder and battery arranged as indicated in the diagram. In use, a small pinion A, provided with ten teeth, should be fitted on the shaft whose speed is to be determined. The instru-ment is then brought close to the shaft, so that the plation A will mesh with the gear wheel B. The speed of the shaft in revolutions per minute may then be determined by counting the number of clicks in the

oversimine by comining the number of check in the sounder and multiplying by  $\frac{B}{A} \times \frac{D}{C}$  or 110; for pluion A will have to turn ten times before the gear wheel B will make one complete revolution, and the zear wheel B with its pinton C will have to turn eleven times while the gear D is making one, complete revolution

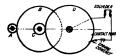


Diagram of the speed indicator.

# Inventions New and Interesting

Simple Patent Law; Patent Office News: Notes on Trademarks

#### A Self-contained Diving Outfit By Our Berlin Correspondent

THE diving outfit designed by Messra.

The digerwork of Libbeck, Germany, makes the diver independent of atmo-spheric air, by supplying him with oxygen and regenerating the air he expires. The outfit comprises an apparatus worn like a knapsack where the air circulating in the helmet and the diving suit is purified automatically of the deleterious gases produced by breathing and regenerated by an addition of oxygen. The diver thus has at his disposal on to 70 litres of air per minute, i. c. 3,690 to 4,200 litres per hour, which suffices for even the most exactling work.

The repenerating apparatus comprises steel cylinders filled with compressed oxygen, a potast cartridge and circulating arrangement, viz., a section and pressure mozale and a pressure reduction valve. It is connected with the helmet by two short lengths of hose, one of which serves to draw off any used-up air, while the other supplies freely air.

The apparatus is started up by opening a vaive which is very easily handled; it will work from 2 to 3 hours, in accordance with the personal skill of the diverand with the quantity of carbonic acid mentals by buying.

secreted by his lungs.

In the place of the usual lead ballast the diver carries on his chest a weight constituted by steel bottles where compressed air or highly compressed oxygen accumulated ccumulated. Whenever the diver outside help, he simply opens the valve se bottles, thus causing air to into his outfit and to impart to the latter the required bnoyancy. This is how is cases of emergency he will from any norinal depth reach, in a few moments, the nail depth reach, in a few moments, the surface of the water. A safety valve actuated with any excess pressure pre-vents the diving outlit from bursting with any accidental rise from considerable If on the other hand the diver ened to fall even to a small depth, his life would be seriously endangered ss some special safety device were provided. In fact, any sudden increas in pressure would throw the diver's body into the helmet, like the piston of an engine, while the congestion produced at the same time might cause the man to swoon, so as to be unable to prevent a cata-In order to obviate this danger, the belief of the new diving outfit has the nemer of the new diving outh has been made of a subtle and substantial India rubber fabric, protected by a metal cover against any mechanical injury. Should the diver imppen to fall, the pressure of the water would compress only the air in the outfit, but the air in the belief, the India rubber fabric of which will yield in the same way as that of the outfit. While the diver thus would feel the sudden increase in pressure, he would experience it uniformly on all sides, which would first of all prevent ongestion He will thus be able. full consciousness, to allow some air to enter his outfit from the ballast on his chest, thus re establishing normal condi-tions at a moment's notice—A safely acttelephone. which on account of the feeble noise of the air circulating in the oppuratus insures a very satisfactory conucction, can be attached to the helmet The telephone cable and signaling string can be combined in a safety cable for hauling the diver to the surface in ca of emergency.

The type of apparatus so far designed is destined for depths of 20 meters as a maximum Apparatus allowing the diver to work at greater depths are in course of preparation.

The carbonic acid expired by the diver-



Diver coming to the surface of his own accord.

A self-contained diving apparatus ready for use.

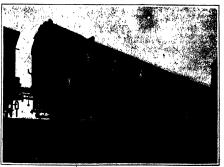
is absorbed in the potash cartridge attached to the knassack apparatus where the air passes in succession some flat cups theed with numerous gratis of potash and soda which absorb any trace of carbonic acid. The air thus freed from any deleterious gases produced by breathing resches the suction and pressure valve, in order there to be repenerated with a supply of 2 liters of oxygen per minute. The air conduit supplying the fresh air to the mouth and nose of the diver, closes the cycle performed by air circulation. The diving outfit acts, both as a breathing bag and an air reservoir in critical moments.

A special feature of this apparatus is its allowing the diver to work for hours below the surface without any connection with the land or ship, whenever the safety string has been cut or the telephone connection interrupted. Any pumps and the men required for their operation are dispensed with, the diver-



Solenoid controlling the brakes.





Guard's compartment containing the railophone apparatua.

carrying about with him the air supply required for his breathing. Moreover, there is no risk of the diving outfit becoming twisted with the air conduit; and the cost of operation is extremely low.

#### The Railophone By P. F. Mottelay

ANS VON KRAMER, an electrical engineer of Birmingham, has invented a system of wireless railway, telegraphy, telephony and train signalling, of which several successful public demonstrations have been made. The apparatus is called "The Railophone," and operates by electro-magnetic induction between cells placed on the train and a cupper wire or cable supported on short posts or, preferably, buried under ground, parallel with and outside of the track.

For use in telephoning between the station and the moving train the train equipment comprises we telephone transmitter and star of head telephones placed in a month of the star of the star of the star ment of a cost. These instruments are electrically connected with two large colls of copper wire wound on frames called "Ballophone Frames," which are stapended from the couch by trou bracksts, The upper frame is suitably wound for sending and the lower for resetting.

sending and the lower for receiving. The telephonic currents produced by the voice create a fluctuating magnetic field which emanating from the upper frame, induces an electric current of corresponding period in the underground wire, which is connected to telephones at stations and, if destred, may be connected with the general telephone and telegraph system. There is no mechanical contact between the buried wire and the moving train. Conversely, telephonic currents sent through the buried wire from instruments at stations induce corresponding currents in the lower ratio-phone coils, which are connected with the receiving instrument on the train.

In the original system there were no means of "calling un" and the operator, like a wireless operator aboard ship, had to be in constant attendance. This defect has been remedied by the addition of a very sensitive detector, which picks up the exceedingly feeble electrical impulses received on the train by induction and "relays" them into currents strong enough to ring a bell or sound a horn.

For telegraphing it is merely necessary to connect the wires by suitable switches with the telegraphic instruments, instead of the telephones. With the telegraphic instruments signais can be transmitted by the Morse key and code.

For railway signalling the resonating relay or detector already emotioned is employed. This instrument, the invention of Dr. Kapp and Mr. von Kramer, possesses several unique features, including its extreme sensitiveness and facility of tuning to different frequencies. It has no movable parts, requires no adjustments whatever, is unaffected by mechanical vibrations of frequencies differing from its own and is of very simple construction. It is so sentitive that it can be operated by 1/8 volt and 1/4,000 ampere. It consists of a magnetic system acting on a tuned steel reed, one end of which is rigidly attached to one pole of a powerful permanent magnet, while the other end is free to which the other pole is divided. The feeble alternating current which is received by induction, passes through two coils which act together upon the free end of the reed. Whan the frequency of these currents corresponds with the natural period of the reed.

with this relay, which is un by outside disturbe nces, whether d or mechanical, such as vibra the to vehicles, it is possible to ring sound atsam whistles or automories, operate locomotive valves, sigevers, interlocking gear, vacuum and signal lamps. The detector even been successfully adapted for matic stopping of trains.

etion of track between two coneve signal stations is divided into distinct parts: The Main Section, 1 mile to 10 miles or more in length; sestoring Section, and the Clearing

n, each about 100 yards long.
following results have been obthe Main Section, a red-lamp is lit signal station. This lamp is placed the signal controlling the semaphore.
red lamp remains lighted until the s red imp remains agained until the which are just prevented from becoming in and the Restoring Section beyond.

In a recent demonstration of the apparaintaneously with the lighting of the ratus messages were sent from a moving up, a bell, or betzer, is sounded, as an itrali to a station and from the station ptect the section by displaying the nger signal. If he does not obey the more is automatically operated, and the large man and over release movement is recorded. The signal letter, operator at the signal status, whether moved automatically or by the derator, remains electrically locked in the danger postition until the trails has Making Paper from Redwood the danger position until the train has left the section. If the lever is operated automatically an alarm gong outside the which has herefolore been practically a signal box is sounded and the time of waste product of the many large lumber the occurrence is automatically recorded, mills of the State, is likely to be used to a so that a strict control is kept over the large extent in the manufacture of paper. signalizati. When the train enters the Heretofore redwood lumber mills have Clearing Section, the red lump is automatterily extinguished and a green lump manufactures for the reason that there hen the train leaves the Clear ing Section, the green lamp is extin-guished and the signal lever is unlocked. After the train has sent out signals indicating its entrance into the Main Section. enabled to receive signals or instructions by telephone or telegraph. It can be brought to a standstill by the signalman at will, or the conductor can place elf in communication with the signal

If a second train ignores the dange and enters the section, both signal trains are automatically stopped. Should a second train enter the section in the opposite direction, the same result enso that head-on collisions are im-ble. When the train has left the Clearing Section, the instruments at the station are restored to their normal condition, but should the train be prevented from entering the succeeding Main Section, the green lamp continues to glow, and the alarm gong to sound. For signaling in foggy weather a special fog signaling attachment is added to the train equipment by which the train is automatically stopped in each Clearing

The essential features of the Railophone may be summed up as follows: The transmission of signals is effected by induction from wires which are safe-guarded from accident by being placed guarded from accident by being praced-underground, and thus a reliable connect-ing link between stations and trains is established throughout the whole journey. The signals are unidirectional and cannot stray to other trains, as may occur with ordinary wireless signals. The system requires no sliding brushes, contact bars switches, bonded rail joints, or any struction of the track, and it is not influenced by atmospheric disturbances or climatic conditions. The cost of mainte-nance of the underground circuit is trifling and the initial cost per train mile is ex ingly small.

The system comprises five principal groups of apparatus: First, the stationary groups or apparatus: sirst, the stationary rafts or other devices, launching apparatus, underground conductors; second, the mor- shire direction carried by one coach of each ratis; fitting, the tunable detector employed as a relay; fourth, the detector are played as a relay; fourth, the directnet-ratis current apparatus, telegraph and the pared to demonstrate the utility and efficacy that is the selection of any device they may have to present.

which automatically operate the alarm ignals and controlling gear.

The adoption of the system does not any essential change in regulations. In ordinary conditions the operator at the signal station has no additional apparatus to attend to, but is merely re paratuse to attend to, but is merely required to observe the audible and visible signals. As the engine does not carry star any raliophone apparatuse the attention of the driver is not diverted from his engine. All the apparatus on the train is mounted on one coach, and trains can be made up and engines complete in the ordinary way. Instead of encouraging caracteristics ways an entirely automatic system of control ling trains might do, the rallophone system of surfaces and the provision of the view and sufficient in the results of the control of the contr with the apparatus: When a train the Main Section, a red-lamp is lit signal station. This lamp is placed means it is probable that a large proportion of the very numerous slight accide which are just prevented from becoming

ditional warning to the signalman to to the train, the moving train was warned by audible signals, stopped automatically, and also by the station operator, and rer is automatically operated, and its

#### Notes for Inventors

Making Paper from Redwood Bark. seems to be no way of removing the red color. Recently, however, a process has been discovered by which the color can be removed or changed, so that white paper may be made of the redwood bark. A company has been organized to manufacture paper from the redwood bark and is purchasing the waste material from the big mills in the forest regions of Mendo-inc County, California.

Dentists as Inventors --- Vou any protty sure to find an inventor if you scratch a dentist, for, under the skin, practically all of the profession exercise the creative art.
This is not to be wondered at because of This is not to be wondered as because of the intelligence of the dental doutors and the fact that operative and mechanical dentiatry both call for a high degree of mechanical ability; the combination of intelligence and mechanical ability and their exercise being sure to result in inven-tion. That many inventors are found among the dentists accounts, in part at least, for the high development of the science especially in this country. Considering all of this, it is strange that no one successful and the state of the filling would probably mark the greatest advance made for years in the dental art

Life-saving Appliances.—The Board appointed by the War Department with Lieut.-Col. Chauncey B. Baker, Deputy Quartermaster-General U. S. Army, as its president, to consider the question of in-stalling additional and suitable life-saving equipment on army transports in compli ance with Act of Congress approved June 14th, 1912, has arranged for a meeting of the Board to be held at Newport News, Va., about the week commencing October 7th, 1912, the exact date of which meeting can 1912, the exact date of which meeting can be ascertained later by addressing Geo. A. Anthony, secretary of the Board, office of the Quartermaster-General, Washington, D. C. It is the purpose of the Board to consider at this meeting any life-awing apparatus, including lifeboats, Jaunches, rafts or other devices, launching apparatus, launching apparatus, the control of the control

RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC

#### Pertaining to Apparel.

#### Pertaining to Aviation.

Pertaining to Aviation.
ARIOPLANI-N-8 N. Yassirstono, 2510 W.
18th St. Wilnington, Del. An object here is to provide a pair of operating levers, each pair of said levers having double functions. thereby reducing the necessary number of vided with neural networks of the new formation of the neural networks of the neural

Section 1. Security of the supporting the section of the provide an exposure of the section 2. Security of the section 2. Section 2.

of the machine.

ARROPIANE.—J A. Bannitt, 70 C Yama shits, 6 No Yokohama, Japan. This invention varies most widely from the form of construction in the present state of the aviation art in the following distinctive features in the construction of the planes, in the employment of beinning members actuated by shifting the aviator's body, the operation of the testering radder by means of the Feet.



and the mechanical means whereby this is ac complished, the manipulation of selvitating and balancing planes and the simplified mechanism whereby the same is accomplished, and the construction and employment of self-contained carth traction driving wheels which may be discontinued immediately the aero-plane is lifted from the ground. The machine is herewith above in a perspective view.

#### Of Interest to Farmer

Of Interest to Farmers.
EXILITER FAN.—S. RERABERT, 1138 Poplar
St. Memphia, Tean This Improvement is particularly in that class of exhaust fass illustrated in a former patent granted to Mr Rembert, the present investion seeking to provide
a construction by which the seed cotton or
similar naterial anniel of by the fin may see
drawn in by the fan, thus embling the discharge of the seed cotton and dust-laden air
at different points and separately
PHANTER ATTACHIMENT FOR CILIT.

cuarge of the seed cotton and Gust-inden aff at different points and separately CHLINT PLANTER ATTACHMENT FUNCTION TO A CONTROLL OF THE PROPERTY OF THE PROPER

Of Geometal Interest.

BUILDING INDIFT AND YENTILATOR...

P. Renvickar. 116 Breadway, N. Y. N. Y.
This invention exists to shylghit and similar is pictured in the accompanying building lights, and its object is to provide a la indicator is provided which is for light and weather the render of the usual pointer and the usual pointer and the usual results.

proper illumination of the space below by the use of refeated rays of light, and to provide a thorough ventilation of the said space COLALPHILE HARREL. J W KETHER LAND, 48 DOTHGER N, 84 MEN, 64 DOTHGER N, 84 MEN, 64 DOTHGER N, 84 MEN AND A SOLIC CHARLE WAS A S

ready for use
STEP FOR USE IN RUILDING CONSTRUCTION.—D blown, 44025, E 5th 8t, Los
Angelos, Cai This inventor's purpose is to
prottle a stud which can be readily stamped
and worked out of thin metal to spir till forms
and shapes white is light in weight and provided with simple nears whereby lath or other
which be material may be easily attacked to
the same.

sain sites at the time when the latter are properly positioned to receive said boils.

HILLE FOR DIRECTORY GHINDING STONES.

E. Washing, over of Trimourous MachaE. Washing, over of Trimourous MachaLites to means for burring wood poly grinders, and provides a burr for dressing, roughing or, as usually termed in mill practice starpeding provide a clearance for the dutor or small particles removed from the peripheral face of the grinders atom, and to reader the text of the grinders atom, and to reader the text of EMMEMMERICAL CHITCHI — I Case, on the EMMEMMERICAL CHITCHI — I Case, on the complete of the complete of a clutch having a body portion and a number of swinging bals or Jisaw reformed as to grip the artible to be supported, the weight of the sairthe sliding materially in the gripping artium

Heating and Lighting.

#### Heating and Lighting.

Heating and Lighting.

SAPETY GAN VALVE—II. It. Cox. 01 Center Ni. New York, N. Y. and W. Stating. New York, N. Y. and W. Stating. New York, N. Y. and W. Stating. New York, N. Y. and the control compressed as self-colonity with control compressed as the control value of the control to the c

register (AAN AND SMORE CONSUMER — J. Han-MON, 308 Superior 81, Duluth, Minn. This invention is embedded in a form or cylinder attached to the side of a formace above the for controlling the draft and with a parti-tion or false bottom which is spaced from the true bottom of the dram to form a passage way for admission of air through the spec-tured from the of the partition of the partition.

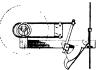
tured front end of the partition

Buokehold I 'illision,

FOLDEN' INED - L. B. Jasecott, 220 W.

IGH 84, Manhatan, N. 1 N. Y. For the
purpose of this Invention, the mattrees frame
is made in sections, of which the head and
foot sections are U shaped and the middle or
intermediate section in formed of side bars
pitotally connected with the side bars of the
bead and foot sections, and pitotal connections are provided between these sections and
the bead and foot of the head.

ELEVATOR INDICATOR —F A Borness, Bergenfield N J In carrying out objects of this invention, a side view of w



The special

axie therefor. Rigidly connected with this axie is a grooved wheel designed to carry a substantially "basped har arranged to be driven back and forth over a pulley, whereby the pulley is rotated. This reciprocating har is connected with a pivoyally mounted lever which in turn is connected by a suitable cable to the usual indicator rod or cable.

to the usual indicator rod of case.

TANNING DRUM,—C. Hass, Strassburg,
Alsace-Lorraine, Gernany, This invention refers to revoluble drums provided with trun
ations on the drum heads. The object is to
provide a tanning drum arranged to relieve
time breads of the drum of all undes strain
and to transfer the strain directly from the
rim of the drum to the trunnlons.

rim of the drum to the transions.

Sillib RHST -4; R KAGMARIK, 588 E.

Sind St. Manhattan, N. Y., N. Y. For the
purposes of this invention use is made of a
spindle mounted to turn in the tool post and
provided with a horizontally-disposed guildeway on which is mounted to slide a head for
carrying the tool, the said bead being congaged



and without injury to the fow!

TAMPING MACHINER—O NOLAN, 1492

Sherburn Ave, St. Paul, Minn, The object
of this invention is to provide a machine for
tamping quickly and firmly concrete into
molds, wherein a pirarity of tamping devices
or stamps is made use of, operating in succession by manual means or by power and
having means for holding the stamps in impocentive position.

orative position
FIX AND MONQUITO DESTROYER.—J. T.
PLEMER, Salt Lick. Ky. The principal object
which the present invention has in view is
the provision of a mechanical device to
rapidly rotate invisitie whip-like members
across a passage to atrike and so destroy files
monogultow or other winged insects when

in the second passes of the retain of the sector when it with the second passes of the sector when it will be sector when it will be sector of the sector when the sector of the sector when the sector of the wheel print stock to render the stock to the wheel print stock to render the said side true with the innor surface of the stock to that any inequalities due to bending or shrinkape are compensated for and the stock period of the wheel print stock to render the said side true with the innor surface of the stock to that any inequalities due to bending or shrinkape are compensated for and the stock period of the sector which is sufficient to the sector of the stock of the sector period of subsequently feeding the stock correctly through a planet to insure the perfect formation of perfect wheel rime.

WEAVE — J C GAYNOR, 460 E B BH St. Throughout the stock of the sector which is the sector of the cloth wown to be cut without presenting and the stock of the sector which is the sector of another to be discussed the sector of another to be discussed to the sector of the sector of another to be discussed to the sector of the sector which the sector of the sector which the sector of the sector which the sector was the sector of the stock of the sector was the sector of the sector when the sector of the stock we believe to the sector of the stock when the period the sector is the sector of the stock when the period the sector was the sector of the stock of the sector was the sector of the stock when the period the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector was the sector of the stock of the sector wa

separately from the removed pulp and ma-

terial.

METHOD FOR TERATING COFFIES SERRING—J. M. Uncertain, Barness, Cuba. This method constate assentially in subsiding and, method constate assentially in subsiding and, pulp of the berry, then subjecting the herry to a grinding, tumbhing and breaking action to cause the abraiding makerial to locous and detach the pulp from the berry, and finally separating the berry from the venoved pulp and the pulp of th

and braiding material.

BOTTLE CLORINO DEVICE.—F. Beales,
Vicana, Austria, care of B. Bochner, lawald
(lass Co. 25 West Broodway, N. Y. N. Y. Tebs
improvement relates to a device for securing
as object of the invention is to provide a
machine which will rapidly and firmly prese
the fiange of the can outsered into eaguement with an internal groovs within the
mouth of the bottle or other vessel.

#### Prime Movers and Their Acc

for the engine to backfire

VALVE FIDE ROTARY GAS ENGINES.—W

8 THOMPSON, care of Ga By & Electric Co.,

Nonyran, Gar Tha invention related to a valve

for facilitate the storing of the combatthle

mixture under pressure in the firing chamber

lefore ignition, and the release of the same

therefrom after ignition, to apply the power

of the burning games to produce rotary motion

of the moving parts

of the moving parts.

RUTARY EMINIB—H. LINDSNARSO, 817

Smith St, West Hoboken, N. J. This invention has reference more particularly to an engine which comprises a stator, a rotor previded with a piston movable into an operative and an inoperative position, and means whereby said platton when in an operature position is partly balanced by live steam or other fluids under pressure.

#### Railways and The

Ballways and Their Accessories.

DECK MARIE AND THANSOM—T. W. CO-TILE, 382 Green St. Topeka, Kan. This inven-tion provides a transom which may be used in railway cars and which may be opened or closed by a single movement and whose closed will be positively locked in position. The sash may be opened to present ventition and may be held in open position by a simple and inex-pensive median.

presenting an edge which will ravel. The provide a reverse arranged at any said across a drug piece of client, which will use the conject is to provide a reverse deck.

It is to provide a verse arranged at any said across a drug piece of client, which will use the conject is to provide a controller presenting in the provide a controller presenting in the provide a controller provide a

metal and arranged to discrenishly change brace the rail in position. The also prov-a tie and functions formed with suit under members and braces and a its structure appropriate the sales, formed with a sub-



COMBINED BAIL PASTERER AND THE

tially U-shaped bar in cross section and a plate having raised members designed to ac-commendate securing bolts for holding the brac-ing members correctly in position. As es-larged transverse sectional view through a rail and combined fastener and the is shown in the engiration.

IN THE SERVING.—M. HODOK, agent for C. & N. W. By. Woodbine, lows. This invention has reference to cranse adapted to erected at the side of a railway track and having measure for so holding the said hear at opermit the bag to be automatically tabus up by a peasing train, when the lower arm up by a peasing train, when the lower arm



MAIL CRANE.

will drop, and will strike the upper end of a trip lever, and thus a pin will be withdrawn from engagement with a pull red, and allow the upper arm to fall. The engraving her-with presents an elevation showing the cran-and its appurances in the position of hold-ing a mail bay.

DESIGN FOR A LOCK JAB.—FIFLAT, DICKS & Co., Ltd., Magazine, cer. Common Sta., New Oriensa, La. in this ornamental design for a lock jar the main height of the structure is reached in panel elevations that have protruding edges at top and hass. The cap of the jar adds to the ornamental design, the whole presenting a simple yet highly attractive articlet.

DESIGN FOR AN AUTOMOBILE HOOD.—
F. PURKUE, care of Oesterwichlach Daimler, Motoren Geellenbeft, Whener-Neustaft, Austria-Hungary. In this ownamental design for an automobile head the after elevation above a construction having the simple and graceful lines that picture strength and elegance.

Norm.—Copies of any of these patents will be furnished by the Screnzypre Amisticke for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

We wish to cell attention to the Inct their we are in a position to render comprises and vious in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and presents all pictuit applications, irrespective of the caughts stakery trained to prepare and presents all pictuit applications, irrespecting of the caught stakery calculated, technical, or advantage as to validate year intraspectate of patents, see with regard to conflicts arising in trade-mark and the validate of the conflicts arising in trade-mark and the validate of the conflicts arising in trade-mark and the validate of the conflicts arising in trade-mark and the validate of the conflicts arising in trade-mark and the validate of the conflicts arising in trade-mark and the validate of the conflicts arising in the conflicts arising in trade-mark and the validate of the conflicts arising in the conflicts are arising in the conflicts arising in the conflicts are arising in the composition of the conflicts are arising in the conflicts are arising i

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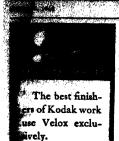
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#### Landsman's Log

(Oppointed from page 41)
tilt and thirteen either under construc tion or authorized, making a proportion of only about one and one third destroyor only about one and one third descroy-ers per battleship as against the four which are necessary. In the maneuvers which I was privileged to witness, a feet of eight battleships was accompanied by or eight battleships was accompanied by mineteen destroyers, or say, less than two and one half per ship. Had there been four per ship, the intervals between the destroyers would have been less and the chances of picking up the submarines would have been proportionately in-

The Navy Department has very wisely adopted a policy of extreme secrecy as to the maneuvers of the torpedo-boat arm of the service; and, consequently, much that I witnessed during the succe I witnessed during the successful escape of the fact from Newport to the open sea cannot be written down in this log. Suf-fice it to say that the operations were completely successful and bore tribute to the effectiveness of this arm of the

During the afternoon, in returning to harbor, our group of five destroyers went through a series of evolutions which, as viewed from the bridge of the flagship and through unfamiliar eyes, displayed the facility and accuracy with which these craft are handled by their captains We found anchorage for the night in one of the many sheltered harbors of the Rhode Island coast; and it is nothing to the discredit of the ship's company that they congratulated themselves on the fact that for this night at least, they would lie where the waters were so quiet as to give an opportunity for undisturbed sleep. (To be continued.)

#### A Problem in Selling Electricity

THE invention and introduction of the new, durable tungsten filament lamp, which produces between two and three times as much light with the same cur rent consumption as the ordinary carbon filament lamp, has placed the central sta tion industry in a peculiar position and indeed in a crists. indeed in a crisis. Thanks to the new lamp the consumer has it in his power to secure from the electric light company a much greater amount of light than form-erly possible without increasing his bill for current. It might be supposed that, be-cause the new lamps have rendered it possible to obtain twice the amount or light formerly possible for the same amount of money, the number of con-sumers of current would increase, and that the central station would profit thereby. As a matter of fact, the inpossible to obtain twice the amount of crease in users of the new tungsten lamp means a proportionately greater loss to the central station It costs just as much to read the meter of a consumer who burns tungsten lamps as it does to read the meter of a consumer who burns carbon lamps. The investment in coal, insu-lation, and the like required per customer is about the same regardless of the size of wire required for his connection, but depends somewhat on the density of service or the number of connections within a given area. The bookkeeping, expense of meter repairs, and maintenance cost, are no less in one case than in the other. Hence, when the consumer demands the installation of tungsten lamps, the cost to the central station is just as great and to the central station is just as great and possibly greater than it ever was before, but the income based upon the running current charge is reduced. While it is true that the lessened demand on the part of the consumer releases so much more capacity for the supply of new customers the cost of serving these new customers is out of proportion to the additional reve-nue produced. The high efficiency lamp saves the central station only coal and oil—it does not diminish the fixed charges. It does make it possible to take on new customers without any increase in the ountral station investment, and with little increase in distribution cost, but with constarrate increase in other costs which still entirely under the heading of ou-loner's charges.



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Albert A. Hopkins A. Russell Bond The Editorial Staff

The Scientific American

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instant relief. But more than that, if remove the corns. If you apply it is a fifty, then forget it. Within 48 hours the whole com loosens and comes out. No pain, no soreness, a condition or in this way, while you could conver in this way, while you are the condition of the con A in the picture is the soft B & B wax. It loosens the corn. B protects the corn, stopping the pain at once C wraps around the toe. It is narrowed to be comfortable. D is rubber adhesive to fasten the plaster on.

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June 7, 1912.

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The articles on Socialism by Allan L. Benson have been Lunion in Pearson's Magazine since April. They will be completed in November. Eugene V. vember. Eugene V. Debsand Victor Berger have said that they are the best expla Socialism that has been printed. These articles show simply and comprehensively what intelligent Socialists think that Socialism would do for this country. A copy of every back issue of Pearson & Magazine or a pamphlet containing the articles on Socialism will be sent with a year e subscription (beginning now) at the regular sub-scription rate, \$1.50

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years, have been charging for electricity according to the quantity used. A customer who uses 100 units of electricity would, under their systems of charging pay 5 times as much as the customer who uses 20 units. This seems on first thought to be a perfectly logical and fair method of selling electricity, and its appearance of fairness has made it the more difficult to show its actual inequity A moment's consideration will make it plain that another factor must be considered in deter mining the cost of electric service, and this factor, when duly considered, may show that the cost of serving the two cus tomers just mentioned may be relatively much greater or much less than the five to one ratio indicated by their relative onsumption. This factor, so important but so little recognized in rate systems involves the fixed service costs. Its relation to cost of service may best be illus trated by a concrete example.

Suppose that you decided to put a little electric generating plant in your basement to supply yourself and several of your neighbors with electricity, for which service you desire to charge them enough to cover your cost You buy an electric generator, a gas engine to run it and a switchoard, and have them installed upon able foundations. You erect a short pole line (or else bury the wires underground in a conduit) in order to carry the elec tricity from your plant to your neighbors You buy one meter for each installation (your own included) and con nect up to the house wiring. Before you have sold a single unit of electricity you have had to invest possibly a thou dollars in equipment, conduit or poles wire and meters

Your plant is now burdened with cer-ain fixed charges. First there is the interest on your money, then there is the amount which you must set aside each year to replace equipment us it is worn This depreciation allowance is important, for if it is not recognized after your plant has been in operation fo a number of years you would find that your initial investment of \$1.000 repre sented a lot of nearly worn-out machin ery and equipment worth at the most a few hundred dollars. You must, there fore, earn more than the interest on you investment in order to come out even; otherwise it would have been better to have left your money in the bank, where at least the principal would not waste You next find that you have to take out insurance on the plant, and you also figure that the space it occupies your premises is worth a little. Alto gether, your calculations show that you must make about \$10 a month in order to just cover the fixed investment charge

As some of your neighbors wish to use electric irons during the day, you find you are expected to run the plant, we will say from 6 A. M. till midnight. At the end of the first month you find your gas bill of the plant to be, we will say, \$5. This represents running expense, which is dis-tinct from the fixed expenses previously considered. Let us suppose that you find hat the meters show that 125 unit watt hours) have been consumed during the first month You, therefore, divide the \$15 total expense for the month (\$10 fixed plus \$5 running expense) showing a total cost of 12 cents a unit, and you make out the bills for the month at this rate. You discover a peculiar thing, however, in looking over the record of monthly consumption of electricity. St lives in a very small house with only 15 lamps, has used as much current as Brown who, living in a large one, has 50. look into the cause of this and find that Smith has bought an electric iron, a small electric stove, an electric chafing dish and several other devices which he uses and several order devices which he used during the day, whereas Brown in the big-house, has used electricity for righting, only. Smith, when he receives his bill at 12 cents a unit, decides to discontinue. nee of most of his devices because h ot afford to pay so much for the sime-conveniences. Therefore, next month



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you find your meters show that only 80 kilowatt hours have been used, due to 8milth decreased use of service. Eighty kilowatt hours at 12 cents brings in only 88.00; and even though your gas bill has dropped from 85 to 83.50 (because you have produced less current) you find that your total expense of \$13.50 has exceeded your revenue by \$3.90, and you resilize that you are louing money.

About this time you hear that a new kind of incandescent electric lamp has been developed that uses only one third as much electricity as the old ones in giving the same amount of light. You begin to lie awake nights wondering what will happen to your plant. You realize that if your customers all started to use the new lamps, they could light their houses better than before on only half as much current. You have visions of the demand for electricity dropping off and your reve ue going with it while your expen be reduced by only a couple of dollars saving in gas, the fixed charge, of course, being not at all reduced. Your plant is relieved of part of its load by the reduced demands and, therefore, could carry several more customers, but in order to reach them you realize that you have to spend a considerable amount in order to extend our wires and buy more meters. would add to the burden of fixed charges our plant must carry, and even if you succeeded in selling as many units as before, you would be getting only the same revenue as you did initially when your fixed expenses were less. Any way you figure you are bound to lose unless you raise the price per unit, and this you know

to be next to impossible.

At last the thought strikes you that if you could only get Smith to use his many electric devices during the day, when your plant is running with but little load, you could afford to charge him much less than 12 cents per unit for the current used in excess of that required for his lighting. You go to him and say, "Smith, you are now using about 10 units a month at 12 cents to light your house. My plant is running with but little load all day, so that the expense to me of furnishing you with current during the day for these devices is only that of the extra gas required to carry your extra load. I am willing, therefore, to sell you electricity cents a unit for all you use in excess of that required to light your house Smith figures a minute and says, "Well, I can afford to use my electric devices at a 5-cent rate, and I will be glad to make such an arrangement with you." end of the month he has used 55 units in-stead of 10. and you bill him for 10 units at the 12-cent rate and for the extra 45 at 5 cents, making a total bill of:

I nder the single rate of 12 cents per unit he would have had to pay 8800 and so did not use the extra current which he is willing to buy at 5 cents. The plan works so well with Smith that you go to Brown and tell about your low rate for use of current in excess of that used for lighting alone. He, too, is willing to avail himself of the convenience of many electrical devices at the low rate. You begin to see that the number of units to be used at the high rate can very properly be determined by the customer's ordinary lighting requirements, and that this in turn is determined to a great extent by the size of his house, allowance being made in all cases for certain classes of rooms which are used but very little.

In this way you develop a rate having a 12-cent or primary charge for a certain number of units, according to the size of the man's house, and for all current used in scoses of this amount you charge a secondary rate of 5 cents. This form of rate may be called a multiple rate (because of the primary and secondary charges) to distinguish it from the single size, at 12 cents per use for all energy inside at 12 cents per use for all energy called as the size of the primary and secondary charges) to distinguish it from the single size, at 12 cents per used for all energy



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# The Panama Canal

Issue of November 9, 1912

The time is drawing nigh when the Panama Canal will cease to be a vision and will become a reality. No engineering work in the entire history of the world is of greater magnitude. For decades statesmen and engineers have urged the digging of a waterway which would unite the Pacific with the Atlantic.

The Panama Canal is a monument to American engineering genius. To describe it adequately the SCIENTIFIC AMERICAN will devote to it the issue of November 9th—the November magazine number. How the great locks were constructed in which ocean-going steamers will swim, how a mountain was cut in two to make way for the Canal, how great steam shovels that scoop up five tons of dirt at a time dug out the bed of the waterway, and how landslides—avalanches, containing millions of cubic yards—were coped with, all this will be told. Our editor, Mr. J. Bernard Walker, made a special trip to Panama in order to gather much of the material which will appear in this number. He spent several which will appear in this number. He spent several weeks at the Isthmus, studied every square inch of the ground, spoke with the men who are doing the great work—Col. Goethals, Col. Gorgas, and the rest—and brought with him facts which have not yet found their way into print, and which will first appear in the SCIENTIFIC AMERICAN.

consumed. You find that by making the cost to the consumer bear some relation to the cost of rendering the service, you stimulate the use of current during the day when your plant would ordinarily be loaded but very little, and thus by encour laded but very little, and thus my escou-aging the use of current for many hours each day you have put your plant on a self-supporting bads, and have satisfied the consumers by giving them a lower average rate for current because they for other than lighting purpos

You no longer fear that you will be riously embarrassed by the adoption of high efficiency lamps on the part of your customers; first, because the reduction in units would reduce the number charged at 5 cents, rather than the ni charged at 12 cents; and second, be with a well developed heating and cooking load you are not so entirely dependent upon lighting for your revenue. You therefore, feel in a position to urge you mutamers to use the high efficiency lawns You know that they will reduce the c tomers' bills somewhat, but not enough to cause you to operate at a loss, and on the other hand your customers will greatly appreciate the increased light which the lamps will give at the same time that they reduce the bills. Electric light is thus made cheaper, and is able to compete with gas, not only as far as convenience and safety are concerned, but in cost as well, and the customer finds it possible to use many electrical devices which he would have otherwise found prohibitive from the cost standpoint.

#### The Heavens in October

(Concluded from page 500.) becured the Sun, though other parts the sky were clear.

The Heavens.

We give again this mouth a detailed map of a portion of the sky which is now well observable in the evening. The principal configuration shown in it is the great square of Pegasus, near the middle great square of regasts, near the module.

Apart from this, it is one of the poores
regions of the sky, being remote from the
Milky Way, and rather sparsely sow
with stars. Among double stars in this
region visible in a small telescope we may region visible in a small telescope we may note Epsilon Pegasi (not far from the western edge of the map, just south of the parallel of 10 degrees declination), which has a companion of the ninth magnitude, more than two minutes of are away—too wide to be really called to double star, but a pretty object; Mr Cygni (about 20 degrees north of the last) a binary pair, now separated by about 2 seconds, and closing up; and Zeta Aquaril, another fine slow binary pair, separated by 3 seconds, which may be found almost on the celestial equator in

22 hours 22 minutes Right Ascension.
Of the constellations in other parts of
the sky, Cetus and the Southern Fish are conspicuous, low in the south; Aquila, Cygnus and Lyra in the west; Ursa Minor Cygnus and Lyra in the west; Oras Manor and Draco in the north, with Ursa Major on the horizon, Perseus and Auriga in the northeast, and Aries and Taurus in the east, while Gemini and Orion are ris-

Mercury is theoretically a morning star until the 4th, and an evening star afterward; but he is too near the Sun to be

Venus is evening star in Libra Scorpio, setting about 6:30 P. M. in the middle of the month, and visible in the

Mars is approaching conjunction wit the Sun, and though theoretically an even ing star, cannot be observed.

Jupiter is evening star in Ophiachus setting about 7:50 P. M. on the 18th:

Baturn is in Taurus, approaching oppo-sition, rises at 7:20 P. M. on the 18th, and is well observable in the latter part of the evening.
Uranus is in Capri

quadrature with the Sun on the 2 crossing the meridian at 6 F. M. Neptune is in Gemini, and is also quadrature, on the appendix side of

Neptane is in Gen understare, on the s



#### 恕, GARAGES \$30 to \$200

#### DRILLING MACHINES













2° M. on October 30, new at 7 A. M. on the 10th, in the first quarter at 7 P. M. on the 17th, and full at 6 P. M. on the 35th. She is nestreat the Barth on the 73h, and farthest away on the 19th. As whe passes round the xolds, she conveninto conjunction with Saturn on the 1st. Neptune on the 4th, Mercury and Mare on the 10th, Venus on the 18th, Jupiter on the 18th, I'vanus on the 18th, Saturn sgain on the 28th, and Neptune on the 38th. Gale's Comet.

The second secon

A comet, visible to the naked eye, was discovered by Gaie of 87,6499, Australia, on the morning of 80,000 me. This it was in 14 hours 27 minutes R. A. and 25 degrees 6 minutes south declination, and was moving northeastward at the rate of about 1% degrees per day. It is not yet observable in our northern latitude, but will probably be so in a few weeks, though until its orbit is computed no definite predictions can be made. Princeton University\_Observatory.

#### Selling Agent Must Not Imitate His Principal's Goods or Trade-mark

JUDGE MAYER, of the United States District Court for the Southern District of New York, has recently issued an injunction in a suit brought by the Gund Manufacturing Company against the Strauss Manufacturing Company, the Ideal Novelty and Toy Company and George Borgfeldt & Coa restraining the defendants from making or selling mer chandise which in appearance simulates the appearance of the merchandise of the Gund Manufacturing Company, or from using in connection with any merchandise the trade-mark of the complainant or any simulation thereof, and further from imitating the advertising matter of the complainant. This decision is important to manufacturers and manufacturers' agents, and in brief it is to the effect that one who has as a manufacturer's agent offered for sale and sold the goods of a manufacturer for and on ac-count of the manufacturer, must not count or the manufacturer, must not after the account is taken from him offer for sale aimliar goods bearing trade-marks like those of the manufacturer or use in connection with such goods advertising matter such as he formerly used in selling such goods.

The facts of the case are these: The

The facts of the case are these: The Stranes Manufacturing Company was under contract with the Gund Manufacturing Company, to sell a certain toy in the shape of a duck which, when drawn over the ground, opened and closed its bill and gave forth a sound such as "quack-quack." The trade-mark applied to such ducks was "brekke Doodles," and in presenting them to the trade, certain funcy circulars were used containing catch phrases such as "A Live One." The Duck That Quacks," and others. "Manufacturing Company he Gund Manufacturing Company he can be such as the such as

The Gund Manutacturing Ounpany, through its attorney, Mr. Charles A. Munn, filed a bill of complaint joining all of these parties as defendants, and asking for an injunction, which was granted by Judgo Mayer after a full hearing. Sudgo Mayer remarked at the hearing that the defendants must not make or sall any duck instating in applearance the duck of the Gund. Manufacturing Commany.

Company.

The declaton of Judge Mayer is in all respects, in ancord with the facilities in the same class. In the same of the case, and the same and case, and case and case and case, and case and



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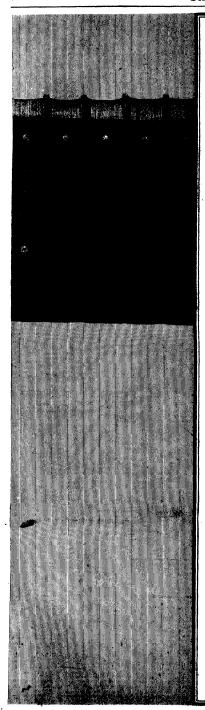
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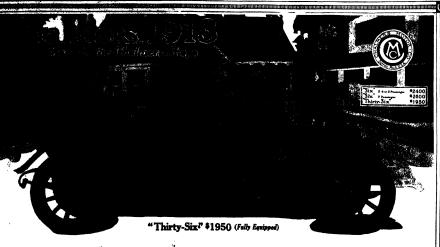
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Here are some facts in automobile history:

The Chaimers Company was the first to produce real automobile at \$1500—the Chaimers "30", laced upon the market July 1, 1908.

The Chaimers Company, in bringing out the "Thirty-Rix", at \$1500, announced July 1, 1911, was the first to drifter medium priced car with self-starter, genutiae long stroke motor, four-forward speed transmission, Continental demoutable rims, and other features previously found only on high priced surprise mobiles, or not found at all on any care at any price.

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Chalmers "Thirty-Six" for 1913 was the first institute priest car to compline the following desirable setures: Turkish cushions, 11-inch uphoistery, inickel trimmings: electric lights, self-starten new, comp, fiush-sided bodies, leng stroke motor, de-

The Chaimer's Sompany was the first to produce a really great 6-cylinder car at a medium price — a truly maximum car embedying not only mechanical excel-sence, but the uncest in luxury—and still selling at a moderate price—\$2400 to \$2000.

without the second

The Chalmers Cempany was first in its racing record. It won more contests in proportion to the number entered than any other manufacturer—a record not yet equalled.

A Chalmers was the *first* medium priced car to win the Glidden Tour and that when the Glidden Tour was a *real* automobile contest under severest rules. Our "30" won under the same rules as the \$4000 and \$5000 cars.

The Chaimers Company was one of the first to establish itself on a basis of manufacturing practically all of the vital parts of its cars in its own plant.

Making our own parts is not only more ecoromical for us; it is better for you. The parts-maker is in business to make money. His first idea is quantity production at lowest cost to himself. Our first idea, in making our own parts, is quality. We don't have to think first about cost, for we know at the start that we can save the parts-maker's profit.

we can save the parti-maker's profit.

The wisdom of our policy of manufacturing our own parts will be more apparent in five years than it is today. Because cars age not bought now merely for one year but for several years' use. Manufacturer who makes his own parts can always take better care of his owners.

These are some of the points in which the Chal-mers Company has led since it started in the auto-mobile business. You can verify them for yourself.

mobile business. You can verify them for yourself.
The biggest reason why the Chainsras Mont Company
has been first so many times is because we have organised our business properly. We have pattently built up
an organisation where each department head is the best
man that could be found for the job. We have fostered
the spirit of co-operation between foremen and workmen
and executives. We have snooranged our people to think.
For we believe that brain power is more essential than
horsepower in running a factory.

horsepower in running a factory.

And 80, because our organization was planned well
and because we were willing to accept the suggestions
of owners, dealers and our own employees, we were able
of owners, dealers and our own employees, we were shie
1908.19We have been able to hold it by having a good
organisation. And we expect to continue because we
have the organization, the ability, the capital, the factory
and his experience to do it.

To tell you more about Chalmers cars and Chalmers methods, we have prepared an instructive and entertain-ing book, called "Story of the Chalmers Car." Write for it on the coupon.

And see our cars at the deeler's showrooms. Com-pare them with other cars. Put them to any comparative test and we believe your first choice will inevitably be a Chalmers.

Send in the coupon today, while you think of it.

#### Chalmers Motor Company, Detroit

#### Reasons Why 1913 Chalmers Cars Are First in the Estimation of Discriminating Motorists

Two great cars claim your attention as the Chalmers offerings for 1913—the Chalmers "Thirty-Six" (4 cylinders) and the Chalmers "Six" (6 cylinders).

The "Thirty-Six" at \$1950, is the new model of the most popular car we ever produced, and is equipped with every convenience and comfort. An all-around car at a medium

The "Six" at \$2400 to \$2600 is a truly maximum car in power, comfort and luxury. And yet, through quantity production and unexcelled Chalmers manufacturing facilities, Chalmers manufacturing facilities, we are able to offer it at a moderate

Note these reasons for the popularity of these two cars .

MATTLY Of these two Cars.

Consider. Medicine control to be bed in the luxurious Turistic cashions, it ingits update the starty, long, whose have (1976 on the Sart) 184 wheels and tires an improved sorting, but wheels and tires of the starty of the start

the sum against seedlest.

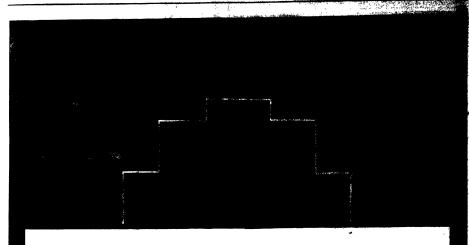
Long Struke Meter – The Chainners motors are ideal for every requirement mile-a-minute appeal, alow rounting in only traffic, till-climbing appeal, alow rounting in only traffic, till-climbing appeal, alow rounting in one of the sum of t

Special Silk Mohair Top-No better top is offered on any motor car

Please send ' Story of the Chalmers Car' and 1913 c it dog

Address

Sc. Am. Oct. '12



# Slaves of Yesterday and Today

The wonderful strides of science in labor-saving devices are well illustrated in the large engineering undertakings of the day as compared with the wonders of antiquity.

It took 100,000 men 30 years to build the Great Pyramid. Today one man could apply the enormous power used at express elevator's assisted by a construction hoist driven by a single electric motor.

More than this, he could raise a continuous horizontal course of the Great Pyramid up a 30° incline at a speed of five feet per minute. To do
this he would need a 6500 h.p. motor similar to that built by the General Electric Company and now in use at Gary, Indiana, turning out steel rails which girdle the earth with highways.

#### Power for Construction

Instead of man or ox power electric power could have been derived from the water running to waste between the banks of the Nile. This is being done at Panama where the Canal, which is being built largely by being done at runniam where the canal, which is being dutil mayby by electric power, will be operated entirely by electric power from a hydroelectric station at Gatun. Practically all of the electrical apparatus purchased for operating this, the greatest engineering feat of the world, was furnished by the General Electric Company.

#### Lighting the Work

With electric lights night would not have interrupted the work on the Pyramid or Tower of Babel. At Gatun, Canal Zone, the cableway unloaders were operated at night with great success, using searchlights furnished by the General Electric Company.

#### **Pumping Water**

Water in the excavations and drinking water for the armies of laborers must have been a great problem for the Egyptians. Along the Catskill Aqueduct, the second greatest engineering undertaking of the world, water is being pumped from the workings, and the laborers' camps supwater is being pumped from the workings, and the laborators caming sup-plied with pure drinking water by the most efficient method—electric motor driven pumps. Over 90% of all electric equipment used by the various contractors on the Catskill Aqueduct was furnished by the Gen-

#### Building to the Clouds

The Great Pyramid is 451 feet high while the Woolworth Building, New York City, is 750 feet, making it the highest office building in the world. Practically all the material used in this building was raised to position by hoists driven by General Electric Company motors.

#### Freighting Material

Slow moving lines of slaves and ox carts carried the building materials to the pyramids and cleared the debris away afterward. Visitors and inspectors were borne on the shoulders of slaves. Today long freight trains carry the wealth of the nation and passenger trains rush at great speed to all parts of the country. The electrical apparatus which moves them has been largely developed by the General Electric Company. The electric power comes hundreds of miles from mighty power plants located over great coal mines or beside rushing cataracts.

#### Recording the Achievement

The Egyptians told of their achievement in building the pyramids by slowly cutting heroglyphics on stone. Today, a few hours after it has happened, the news of the day is reproduced by that wonderful mechanism—the modern printing press. The millions of copies of daily papers in the large cities of this country are produced by glant presses driven large-ly by electric motors. The simple pressing of a few buttons gives the printer perfect control over his press where the G-E motor drive is used.

#### Working Conditions Improved

As electricity has reduced the physical work of man and increased the amount of work one man can do it has improved his working conditions until now a well housed man can move a small handle and do the work of

until now a well noused man can move a small nance and do the work of an army slaving out among the elements.

During the development of electricity as a labor-saving agent many electrical companies have come and gone, making few marks on the sands

In sharp contrast to these the General Electric Company has occupied a leading position in the electrical industry from its inception, which was contemporaneous with the first practical application of electricity, the

# General Electric Company

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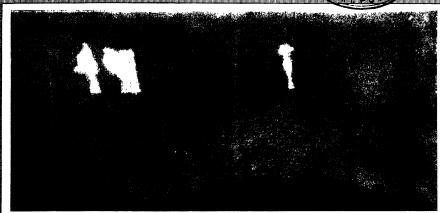
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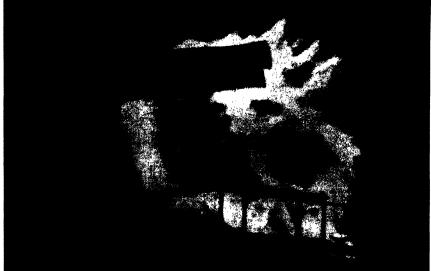
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In foreground seaman is wig-wagging result of shots from storn of "Nebraska," which is towing the target 350 yards astern. Three of the four shots have passed through target, the fourth, a ricochet, will also strike

Four hits by 12-inch shells fired at 14,000 yards by battleship "Kansas."



Copyright 1915 by E Maller.

This picture was taken by the light of the flash of white-hot powder gases

Night firing. Discharge of a pair of 8-inch rifles on board the flagship "Connecticut."

THE IMPOSING NAVAL REVIEW AT NEW YORK .- [See page 306.]

TO BE A STORY OF THE SECOND

#### SCIENTIFIC AMERICAN

Founded 184

NEW YORK, SATURDAY, OCTOBER 12, 1912

Published by Munn & Co., Incorporated. Charles Alien Munn, President Frederick Converse Beach, Secretary and Treasurer; all at 30; Broadway, New York

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The Editor is always gird to receive for examination illustrated articles on subjects of timely interest. If the photographs are mark, the articles what, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### A Warning Neglected

NCE more an express train has been thrown overs from express to local tracks which care a standing memore to the safety of railroad travel. The accident is the more theoreticable because the New York, New Haven and Hartford Railroad Company. upon whose lines it occurred, was reminded of danger only last year, when a similar accident oc-curred to an express train just outside of Bridgeport. The stretch of line on which both accidents occurred has four tracks, the center tracks being generally for express travel and the outer tracks for local trains. When an express train is to make a stop local trains. When an express train is to make a stop at a station, it has to pass from the limer to the outer track, and this is accomplished by means of a cross-over. Safety of travel demands that these crossovers shall be of such a length that the curvature at the switches shall be "easy," so that if an express train should enter the crossover at high speed, it will not be in danger of derailment. That would be good and safe construction. As a matter of fact, from motive of economy and convenience, these crossovers are made comparatively short, with sharp curvatures at the switches, and a standing order is given that speed shall be reduced to a low limit in making the transfer and good; but it often happens that, either through carelessness or desire to make up time, the cro-overs are taken at a speed too high for safety. The sees are made in a speed too mign for sarety. This is what occurred hast year at Bridgeport and this year at Westport. We pointed out at the time of the Bridgeport disaster that such accidents could be prevented by doubling the length of the crossovers. Hid this been done at Westport, the train in all probability would not have been wrecked. This subject is one that well be commended to the serious attention of the Interstate Commerce Commission.

#### Honor to Whom Honor is Due

NDER the title "Eugenics must surely at last be coming to fits own," our estremed controlled the property of the state of

Are we to infer that the writer is so grossly ignorant as not to know that the whole movement for engenies originated in Displand, that even the word cugenies originated in Displand, that even the word cugenies is the creation of the great 81r Francis Gallon, whose death we mourned last year? In our contemporary unaware of the fact that the world's chief center in this movement is at University College, London, where one of England's foremost scienties. For Karl Pearson, is director of the Engenies Laboratory founded and endowed by 81r Francis Galton? Of his sh's natifortism certified away our esteemed

contemporary, lustifing those more ferrid than judiciose remarks? Indeed, le patriothem a proper definition for an encotion which thus clouds a man's judgment? National prejedice seems a more sat berem to describe it. Let our patriotium be such as to invite commendation and not condemnation. Let us be fair, and give hounce to when home is due.

#### Pulicide

OME may imagine it to be an easy thing to kill a flor; such delaudon will be dispoiled by the following statements, which are authorizative, being based on a report on Pire Destruction of the United States Public Health and Marine Heagital Sarvies. It should be premised, however, that the investigation noted, though thoroughly scientifies, was limited in scope; for only the Pasics strates, the Ropoglius commains and the Crestonhalias cavies, with two other varieties were examined; and, as every one knows, this is but rouching the fringe of the five questions, the first passed of the questions.

Pretty much every insect can be destroyed by correding it with chemicals, or by suffocating it outr by euthenizing it with ether or chloroform or laughing gas. Not so, however, the festive flea, which with survive all these modes of execution combined, with others added. It will survive the agency which kills ost," such as the rat or the squirrel; and (with its marvelous power of jumping across infinite distances) will find a new boarding place in another hos-pitable and as yet unvivified pelt. Besides, when can one say that pulicide is a deed accomplished? A fice that not moved for half an hour has been pronounce dead; yet the abandoned creature has afterward sprung up as ready as ever for the part allotted it in the cosmic scheme by a hopelessly inscrutable Providence. cosmic seneme by a nopelessity inscritable Provisence. Again, what were the conditions of the flea before the attempted vivisection? Was it moribund, or was it physically up to par? It has been calculated that, size for size and weight for weight, if a man's jump had as much power behind it as a healthy, robust flea's, he (the man) could easily, from the stre the golden ball topping the flagstaff of the Singer building. So, for the conditions of the experiment, it should be known beforehand if the creature has its jump in normal working order. Again, climatic condi-tions must be considered; the sea will hop and bite with energy in dry, crisp weather; on a soggy day he may not care to do these things, and so may only so

It is almost impossible to drown feas by dropping the into water; but soap and water will do for any feas. Thus is the fles the bobe among inservi; for dipped in threture of green scap be is dead beyond paradventure in two minutes, and no feet of the five kinds indicated could live after being scaped. Another evidence (among so many) of the disreputable character of the fles is that when seaked in absolute alcohol, he may become paralyzed; but he will certainly recover, and (as in the old song) when one puts his import on him, behold he is not there. The strongest whilstless are only fifty per cent alcohol, and there is surely no record of any human survivor who has been submerged in whisky; yet fleas come out seemingly all the better for it, after being scaled fin absolute nicohol (68 per cent). Again, a flea left to swim in formall in a very powerful insecticide) was "apparently dead in twelve hours," but "revived." It took [10] per cent "lenol more than one minute to kill a flea, etc. "e concludon is that water is of little value in flead extraction; glycerine is practically inert; alcohol is practically inefficient; kerosene and mischile off are efficient; formalin, heaton, men and mischile and trekenol in the strength used as disinfectants are of little value, and powdered sulphur of none; the fundamis, bleulphide of carbon, hydrocyanic acid gas,

employed for fee destruction."

It would seem, on the whole that the surent way to kill a fee (and be able to testify under eath that he is really defence) would be to place him on one of those impeneirable plates used in marel warfare, and confuse him thereon by means of cubies fastened securely to each of his several legs; then to train upon him (from as near a distance as would be feasible) an ingressibile projectife from one of those vertex-inch guns. If the fies should not (by reason of the placement of th

#### The Farmer and the Beef Famine

O other one thing contributes more to the success of the Americans in mechanical endeavor than beef—good red-blood-making material. Nobody knows better that there is a best flame than the mechanic. Nobody will appendent upon from the number of best not that he whether the the there is the number of best notice in the number of best notice on the proper of the United States have declined from right-one, and a fast white in the year 1807 to their second upon a dependent property in 1912 (Year Book of the U. S. Bugs, of agriculture, 1912, page 620), and that the decline of grantenium, 1912, page 620), and that the decline of the right-one at the rate of about face one of a hely sufficience, puer. No structure of any kind, whether inheaded for lemma hold, could stand used a loss as this on fix underpinning without damage and loss of the most sections kind.

To a mind trained in mechanics or physics it is clear that the trouble is lack of trusses instead of passence of trusts.

Our Bear Structure Name Americana. Surviver.—
Where are we to look for it? In guite of the high prices of cattle and the good prospect of profit, out of the light prices of cattle and the good prospect of profit, out of the light prices of cattle and the good prospect of profit, out of prices of the light prices of cattle prices of the light prices of the future to the farms and not to the ranches for our best. If we look carefully for that portion of the course.

If we look carefully for that portion of the country in which we can hope most quickly to increase our best supply, we will find it without the least doubt in the cotton-growing States. There is now grown and going to waste in these States enough grass to raise and fatten enough more cattle of the right nort under favorable conditions to reduce the price of dressed beef five cents a pound to the consumer, and still leave a handsome margin of profit to the cattle grower. These barriers of the cotton pound to the consumer, and still leave a handsome margin of profit to the cattle grower. These handsome margin of profit to the cattle grower. These is the consumer of the cotton profit and the price of day, and meal at halls, are extraordinarily abundant and cheap, halls at less than half the price of dour. Over one thousand mile are making this feed and are seastered from one end of the oction-growing lerritory to the other. However, the continue which cotton eventures, to quadruple the unanber of cattle now in the Nouth. If the other cutton States will follow the example of South Carolina of intensive cotton cuttivation and the liberal use of commercial evil for the cample of South Carolina of intensive cotton cuttivation and they are doing now, with less cost per pound and they are doing now, with less cost per pound and careage for pasture. (South Carolina gets 28) pounds lint cotton per acre to Missingpivit 3170 pounds

There are plenty of native estile already in the South to make a start with, though most unewupy distributed and varying greatly in quality and size, as shown by their number in proportion to peoplastion and value at the farm. For instance, North Canolina has about one bend to sky of population—value, 8120; Georgia, about one head to from of population—value, 811; Minsdayly, about one head to there of propolation—value, 810; Okiahoma, about one head to one and one third of population—value, 8210; and Texas, about one and one third head to one of population—value, 8210;

If the older cotton States had as many cattle in proportion to population as Oklahoma and Tezza (and the same sort of cattle) as they might have by natural increase with pure blood beef sires in ten years without importation, the beef problem would be notived.

out importation, the best problem would be solved.

It is not cotton mania that has prevented an abundance of good cuttle in the old certon States, but partly the presence, partly the injury wought by the cuttle factor of the country of the country to the cuttle radius, with the und indifference. Intensive cuttle radius, with the und indifference. Intensive cuttle radius, with the satisfactors, and the maximum of feed raised that contrast with consecutive radius, the sense of the country of the cuttle radius of the cuttle radius of the cuttle radius of the country of the cuttle radius of the radius of

sours to extrus raising or the right sort, not in place of, but in aid of cetton growing in the United States, There is not a consumer of beef in the United States, nor a packing house in the country, a cetton mill, et mill, fertiling factory, merchant, planter or hashes in the South that would not be greatly hesistical detros such joint movements.

#### Engineering

Railrest Speed.—The Pennsylvania Railrest Company has feered orders restricting the mandatum, quant of all pissenger tessies on the system and seas of Fittaburgh to seventy miles per hour. Combal consideration has also been given to the existing quark previous on our vest.

"Signified with "Fiftheress Reyal."—It has been unofficially associated with "Fiftheress Reyal."—It has been unofficially associated with the second test of the new British battlethy evaluer. "Fiftheress Reyal." with is a signe usual to the "Lion." the new vessel exceeded the researed \$2.7 Junets made by the later battlethy cruiser. "The "Fishesses Reyal." is driven by turbine engines of from 76,000 to 75,000 hores-power. Her displacement is 26,800 tens and the carries eight 12.5-inch guns in four tenses, so disposed that they can all be discharged either shead or astern or on either broaddide.

"either shead or astem or on either broaddid.

May Begith Record for a Shamarian.—The new submarine beat "Fa-1" established a world's record for depth during a six-hour submerged cruise in San Francisco Bay on September 5th. The boat went down to a depth for ben minutes while travelling at a speed of six knots, then rising to a depth of 19 feet, it proceeded at a speed of eight knots. The previous record for depth was hald by the "Seal," a Lake type submarine, officially designated "G-1," which went down to a depth of 265 feet.

The New Transfignite Liner "Britannic"—The

The New Transatiantic Liner "Britannic."—The White Star Company has made the official announcement that the new 50,000-ton liner now under construction will be christened the "Britannic." This vessel, which is similar to the "Olympic," will be the largest British-built ship in the world. It will contain a unuber of changes in design so as to protoct it from a disaster like that which befull the "Trikinic." It will be provided with a complete inner skin extending well above the load line, throughout the vulnerable parts of the vessel. The builtheads will also be higher, as

Largest Freighter in the World.—The largest vessels in the world designed for carrying freight accularioty are the "Col. James M. Schoonmaker" and the "William T. Suyder, Jr.," built for operation on the Great Lakes. They measure over all 617 feet, molded beam 64 feet, molded depth 33 feet, with a deadweight carrying capety at 20-400 cfraught of 13,000 tons. The vessels carry water ballast in side tantes and in a doubtle bottom which is 6 feet deep. The total water ballast capacity is 9.440 tons. Each vessel is equipped with a quadruple separation capine of vertical invetted type with an estimated horse-power at ninety revolutions per minute of 2.000.

Terminals for the Barge Canal.—In order to take care of the traffic on the New York State barge canal, which will be comploted in 1915, an expenditure of 818,800,000 has been authorized for canal terminals in New York city and other cities along the canal. In New York city there will be four-term canal terminals, costing altogether \$9,740,000. The balance of the money will be spent in building terminals at twenty-one different cities and towns. Warshouses, sheds, craase, derricks, etc., will not be built at the terminals until after the canal has been completed and the character and quantity of the freight to be handled has been determined.

determined.

Capacity of the Gatsu Lake.—During the week from September 2nd to September 9th, 5.74 million oubic feet of water poured into the Gatsun Lake, rading surface from 38.06 feet above sea level. The total quantity of water reached 200 million cubic feet which is equivalent to 289.244.00,000 gallons. For purposes of comparison we may consider the Rio Grander researche, which when filled has a capacity of sixty-five and a half million orbito feet, or less than one seventh of the average daily flow into the Gatsun Lake. When the surface of the lake reaches level of fifty feet above the see it will contain 58.65 million cubic feet of water, and when it reaches eighty-seven feet, or the preposed maximum level, the lake will contain 192.28 million outbo feet.

"Selandis' Consemigation of Oil.—Some interesting "Selandis' Consemigation of Oil.—Some interesting

contain 192.25 emission outsto rese. "Selandist": Consemption of 'Oli.—Some interesting statistics on the oil consumption of the Dissel ouglin-driven "Selandist": Consemption of the Dissel ouglin-driven "Selandis" are given in Businessing (Condon). On the outward mission voyage the weather was fast after the first two or thisse days. On March 11th, the first day out, the oil consumption was 9.8 tons, and a speed of 9.2 tons was maintained. The highest speed was 19.7 knots, which called for a fuel consumption per day of 10.1 tons. The most efficient day's run required the use of 9.8 tons of oil, with which a speed of 13.8 knots was devidedly undaversible, and yet the daily consumption of oil did not accord 5.8 tons. The best day's run was made on 8 tons of oil, with which a speed of 8.3 knots was makinshied. Had the steemer they are the sealer was made and 5 tons of oil, when he had the steemer three days on the sealer of 15.8 knots was makinshied. Had the steemer three days on the sealer of 15.8 knots was makinshied. Had the steemer three days on the sealer of 15.8 knots was makinshied. Had the steemer three days on the sealer of 15.8 knots was makinshied.

#### Electricity

Wireless Icenegraphy.—We learn from La Revus that a young Italian experimenter, Prancesco de Bennochi, the son of a Turin merchant, has been successful in his attempts to send pictures by the Marconi process. Though only 25 years of age he has been interested in the subject, it is stated, since 1887, having been inspired by Prof. Rhigis' investigations of the Hertzian waves. He has now succeeded in transmitting images, drawings and autographs which retain the precise features of the original with great fidelity.

Electric Signs in Uruguay.—According to the report of United States Consul, F. W. Goding at Montevideo, Uruguay, American electric signs are being introduced into that country and are becoming very popular. Recently an electric display sign with a capacity for forty advertisements was installed in Montevideo. Each advertisement is displayed for seven minutes. The young Uruguayan who installed the sign has found it may be a successful that he is planning to install a number of others of greater capacity in other cities of South America.

Wireless Telegraphy Spark Gaps in Running Liquida.
—In vireless telegraphy the spark in the electrically oscillating circuit is liable to degenerate into an are where large amounts of energy are used. Recent experiments to determine the effect of interposing a running liquid in the spark gap have shown that the voltage required is mover than in air and that the efficiency depends on the rate of flow of the liquid and upon the voltage and to greatly upon the length of the gap. Water may be used, but oil gives better quenching and eliminates the desfenting noises of the air spark.

Effect of Carbon on the Conductivity of Steel,— According to statistics published in Complex Rendus, the resistance of earbon steel increases with the percent of earbon. The resistance of nickel steel also increases with the addition of earbon and also with the increase in percentage of nickel up to 35 per cent. In manganese steel the percentage of earbon down not seem to affect the resistance to any great extent. The greatest resistance is found when 12 to 13 per cent of manganese is used. Chromium steel, too, seems to be unaffected by the earbon content, but the resustance is increased and reduced percoloidly with the mercase in percentage of chromium. Tungsten steel also shows a variation that is quite irregular.

A Large Protective Rectance.—An effective way of automatically protecting large dynamo-electron machines from momentary short circuits is to include a "meatance oil" in the outgoing circuit of the machines, the electromagnetic insertia of this cell serving to check the abnormal rank of current. The 5,000-tilowatt turbine-geometors installed in a London electricity supply statuton are now adequately protected from the severe strain of the momentary "shorts" which are common to electric railway service by a large oil-immerced water-cooled reactance coil designed to reduce the short-circuit current to somewhat less than one half the value it would otherwise attain, namely, 10,000 amperes. The coil reduces the power factor less than 3 per cess than 3 per cess

Why de Electice Warea Follow the Earth's Curvature?—An indexecting hypothesis has recently been suggested by an English physicist to explain how it is that electro-magnetic waves emitted at a wireless telegraph station in Corrusul can be received at a station on the coast of America. If we compare such a sending station (as far as wavelength is concerned) to a source of light on the surface of a sphere about 1½ inch in diamoter, obviously no light from the source could reach even on equater of the way around the sphere; but if the sphere is surrounded by this envelopes of media whose refractive indices decrease from the inner to the outermost, light will be transmitted all around the sphere by successive refractions and reflections. According to the new hypothesis the electric waves are transmitted in an analogous way, viz., by the variation in ionization of the earth's atmosphere.

The Taleghane for Detecting Faultz in an Alternating Current Suesty.—A telephone device called the phanelone, for determining faults in alternating current cables at their loneption, thereby preventing loss and delay by serious short circuit, is described in a German magazine. The instrument, which consists of a mice condenser, a telephone receiver, a spark gap, a non-induction resistance of about one megolum, is employed by connecting it such particular cable which it is desired to test and listening for five or ten minutes at a stated to test and listening for five or ten minutes at a stated time each day to the musical note given by the telephone receiver. The alternating current generated by the supply station nemally gives a pure tone in the receiver, but if there is, a leak of varying resistance, caused for example by a "swing" on the line, the tone is interrupted; and characteristic interruptions of the tone are caused by abd contacts, faulty operation of generators, i.e.. Once the existences of a fault on a particular cable is detected by this meants, the location of the fault can readily be found.

#### Science

An Interesting Etruscan Sarcophagus.—An interesting Etruscan sarcophagus adorned with has reliefs representing episodes of the sego of Troy and bearing traces of their original coloring has been found in a tomb.

Hydrogenated Oil and Milk Butter Substitute.—Carleton Ellis of Montelar, N. J. has secured a patent for a butter substitute or butter-like composition in which edible hydrogenated oil is incorporated with milk material by emulatification.

Discovery of a Relic of André.—A telegram from Tromso received at Christiania on September 13th states that the Norwegian steamer "Beta" discovered on September 1st, to the south of Foreland, a buoy marked "Andre's North Pole Expedition, 1896, No. 10." The buoy was made of oork and covered with copper.

Making Holes in Rubber Corka.—In making holes in rubaking "tapering" holes and "running to the sade" A little ammonia water poured on the rubber and the borng instrument causes the hole to become of uniform size at every point and the operation is accomplished with much more ease.

How to Clean Gas Mantles or Gas Burners.—A good way to clean gas mantles or gas burners that are black-eased by carbon deposits is to sprinkle sodium chlorides or "salt" upon them while burning. This causes the earbon to burn away and prolong the life of the mantle and increase the efficiency of the light or burner. In laboratory combustion furnaces deposits of earbon can thus be removed.

Honers for an X-ray Yletim.—Mile Weldemann, said to be the first victim of duty to the cause of the X-ray, has been decorated with a medal by the Minuster of the Interior of France. Mile Weldemann was employed in 1886 in the radiographic laboratory of a hospital. Hardening of the skin had set in. Last year she had to have both hands amputated. Ultimately she must die; for the amputation of her hands has not stopped the ravages of the disease.

Railroad Dust as a Germ Carrier.—The interest taken of late in the subject of dust, especially along common carriers, is each as to attract attention in all quarters. Recently the Hon. Judson C. Clements of the United States Interstate Commerce Commission has expressed his opinion as to the dust discharged along railroads and amiliar public highways. It transmits deeness germs of a contagious character, he stated, and announced his advoacy of a general law for the regulation of the materi in the interest of the public health. Such a law would doubtless bring forth improvements in the means for controlling the discharged dust and should be of interest to interest skilled in the subject.

The Twelve Mignest Brains in the World.—In point of brain weight, the following n the order named are the twelve leading names, the weights being indicated in granimes: Ivan Tourgoniel, Russian novelist, 2,102; Joseph Bouny, French jurist, 1,365; (Feorge Cuvier, Franco-German naturalist, 1,830; E. H. Knight, American meshamielan, 1,844; Franz, X. Kraus, Greman theologian, 1,500, John Abercrombie, Souttad physician, 1,768; Bengamin F. Butler, American tatlematican, 1,701; Herman Levi, German composer, 1,080, A Winchell, American geologist, 1,909; William M. Thackeray, English movelist, 1,068; Rudoff Len, German composer, 1,078.

The University of Frankfort.—Measures are long taken to organize a new university at Frankfort, and recently the Prussian government authorized this measure, provided the municipality would engage to supply to necessary funds for constructing the university buildings and keeping them up. Burgomeister Adokse now states that the needed amount of capital amounting to \$1,800,000 has been entirely subscribed, so that the founding of the new university as an established fact. We may also note that E. Solvay, desiring to contribute to the work undertaken by Prof. Nernat, who is director of the Physical Chemistry Institute of the Berlin University, has offered the sum of \$2,000 which will be reserved every three years.

Rightean Thousand Dollars for the Jardin dee Plantes.—An anonymou donor has lately made a legsey of \$18,000 to the Natural History Museum of Paris (Jardin de Plantes), and this sum will be devoted partly to making imprevements in the laboratories of zuology and antaropology and in part to the maritime laboratory at Tathon on the Channel coast. On the other hand it is announced that the extensive collections of fossils from the Paris region, Albania, Australia and Tasmania, belonging to the eminent paleontologist Bonnet, recently deceased, have been left by him to the museum. He bequeathed his entire fortune to the Audemy of Sciences. M. Osmond, the well-known metallurgist, let the sum of \$20,000 to the Sciences Mutual 480,000 to different phillathroppic institutions.



While the cost of grading is heavy, stone for the foundation and other work costs practically nothing.

## How One County Built a Good Road

The Story of a Brick Pavement in West Virginia Hills

By J. M. Miller



The read follows the bed of a small creek for a short distance in a narrow valley. It was necessary to cut an entirely new road.

THE precipitous hills overlooking the Ohio River, I in Grant district, Hancock County, West Virginia, and about forty miles from Pittsburgh, will soon be traversed by fine brick-paved driveways suitable for the speediest automobiles and surpassed by few boulevards in Pittsburgh The farmers of the district, some varies in Principal The interest of the district, single of them living in one-story cottages and keeping their horses and cattle in log stables built one hundred years ago, have authorized the expenditure of \$125,000 for the construction of paved highways, and the laying of bricks has already been commenced. Ten miles

of roadway nine feet wide is to be paved with brick.

Most of this road winds up and down hills almost as precipitous as mountains. In some places the road-way climbs the hill at an angle of almost forty-five degrees with a sheer drop on one side of hundreds of while on the other there is a high cliff. the hills traversed by these roads are densely wooded and in some places the readway before paving, appeared to be

than a moun-tain trail. The paved road will be paral-leled by a driveway of the same width as the pavement wherever the ground will permit it.

It was only by clever po-litical strateg), such as would have done credit to the boss of a downtown ward in large city that the persons inimprovem e p i get even a mall bond issue to provide funds for the work A special election to determine whether Grant district should issue road improvement amount of \$125,000 was requested by etition for October, 1911. In October the ronds in Hancock County are nearly althe indica-

In this the promoters of good roads were not disap-pointed. Buggy wheels sank deep into the soft elastic clay and horses could barely struggle through the mud. The result was that farmers who had previously onin favor of the project after they had struggled through tion to decide upon road bonds only, many voters not not declar upon road points only many votes not particularly interested in the measure stayed at home. Most of these men would have voted conservatively against any increased expenditure of public money on general principles, had they been drawn to the polis by the varied interests of a general election. As it was they were not quite energetic enough to venture out over the muddy roads to oppose an effort to secure better ones. The clever planning of the good roads advocates was rewarded for the vote showed that forty-seven in excess of the required sixty per cent of

tions were that they would be worse even than usual. ed the issue of bonds to pay for better roads, voted

The contract for grading, paving and curbing was let by competitive bidding after the specifications had been well advartised. Local farmers, however, did much of the grading.



It was decided to pave the road with brick, as far as the Pennsylvania State line, a distance of three and one half miles.



Graded and ready for paving. The paved road will be paralleled by a dirt driveway of the name width as the pavement wherever the lay of the ground will permit it.



In some places the readway, before paving, appeared to be little more than a mountain trail with deep hollows in which water had collected.

all votes cust were secured in favor of the bond issue Prior to the vote on the bond issue in Grant district two efforts had been made to secure the peoples' ap-proval at the Hancock County polls for a large bond issue to be expended for the improvement of the prin-cipal roads of the entire county. Each time the total vote of the four districts in the county was against the improvement. In Grant district only, where the farms are roughest and stoniest, and where the farmers are poorest, was the vote favorable to the bond issue. In order to take advantage of the favorable local sentiment the promoters of good roads arranged with the Hancock County court to give Grant district an opportunity to vote separately on a smaller bond issue for the improvement of its own roads. Clever management of the campaign and a wet election day

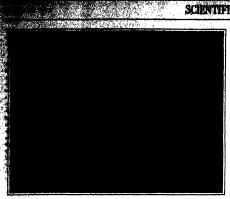
Following the election the county court appointed a commission to prepare and market the bonds. When

been done, move any suspicion of collu-sion and graft, a second commission composed of different men trom the first, was appointed to determine what roads were to be improved, to serials, and to the actual

work. The first and perhaps the most difficult task was to deroads should be improved, for prior to the election the farmers along every byroad in the district had been encou-raged to believe that the highway leading through just as good a chance of being improved as any other. Where a farm was very re-mote the owner's support for the bond ..... sought by a

The state of the s

THE RESERVE AND THE PROPERTY OF THE PARTY OF



With minimum of friction and slow speed of chain travel, very little power is required to keep the ice moving and to elevate it at the bridge.



A 2½ horse-power motor, connected by 200 feet of flexible cable with the electrical supply of the nearest building, drives the ice harvester.

## Harvesting Ice by Electric Power

A Home-made Ice-carrying Machine

By Putnam A. Bates, E.E.

OB several years I have struggled through the winter season with the feeling that another year I would find a better plan for filling my ice house that that which is customary in our section of New Jorsey.

The standard method with us has been to engage several teams early in the wince season and to give the instructions that at the first 'spall' of few weather those teams early to have the considered tons and been safely put away. To the average person this might seem sufficient to get he job done, but, to eight on the construction or rural conditions such an understanding has nothing definite about the same to be the control of the contro

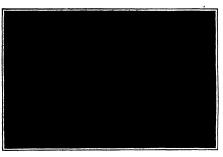
out. On this basis it is plain to see that some one must be disappointed, and it may or may not be my turn, depending upon how the problem works itself out. And again the lake we all out from is some five mices away, over hill and dale, so that one load a day per team is apt to be the maximum rate of transportation.

to be the maximum rate of transportation. What a pleasant surprise, therefore, it was when one day this optim, lust after I had estitled up with any beamsters four the usual winter ordest, on a basic that made the cost of a ton of the on a part with the cost of a ton of the one of the with the cost of a ton of the one of the with the cost of a ton of the one of the with the cost of a ton of the one of the other than the cost of the co

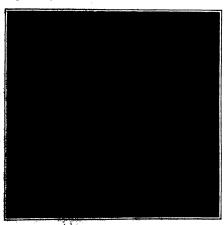
The accompanying filtratrictions show pretty clearly the general scheme. This inventor of this insentions later-saving method is Schuyler S. Wheeler, who farms on somewhat larger spate that of the present of the pres

farine on a concevnat larger coale than a for just over the Becamicalitie Meanhain in the country of Somerust.

My. Whoster calls this machanism an incorpring machine, and, in that, that is just what the just of the larger control of the property of the



Present method of cutting ios. Hand sawing is slow work. An electrical motor could be measted as the carriage of a circular saw; the mechanism being drawn over the ice as with a horse-saw.



Harvesting too with Historian chain and electric power. The ten "fights" are 13 feet apart on the shale, fee on the "going side" of 165 feet. The return trough for the chair is feebused up tight against the stide on its underside.

of lighting the house and outbuildings. The complete harvesting outfit is shown in the illustration. Under its initial test it proved eminently practical and satisfactory in every way, and made it possible to harvest about two hundred tons of ies, using five men and no teams, in four days. Previously it had been the custom to employ four to skt teams, four or five days, in addition to these men. While the outfit was constructed only with a view to meeting the needs of a small private plant, there is no reason why the construction should not be made-bester and the same idea applied to commercial undertakings of like character. In the instance cited, however, the "rig" was made light enough and simple enough the warranted in a netwer house heads.

In the instance cited, however, the "rig" was made light enough and simple enough to be warranted in a private piace. The "flights" are 33 feet apart on the chain, and there are two of them in 330 feet of chain, or dive on the roling side, was made in 12 or 14 foot sections, end of the control of the chain, and there are the control of the chain and the side of the control of the chain is a cross batter or supporting foot, the other end resting on the battered end of the next section. The return trough for the chain is fastered up tight against the side on its underside and the whole rested directly on the ground. Immediately after harvesting, the chain was taken off and the sections lifted and nexted on top of one another in a little covered shed or shelter alongside of the tech house.

The working head is supported on a rectangular woodon frame, which rests and locks on four short posts set permanently in the ground. The power was brought from the nearest building having electric light, by 200 feet of floatible enthe. The 18-head flamenter approached wheelmade 28 revolutions per minute, and at this speed the chain picked up a cake of less four times in fifty seconds. The civerting bridge was binsed at a point along side the main shaft and not upon it, to relieve it of friction, and this and the slow speed of the chain picked his permitting the property of the lootited electric plant that was installed only for lighting purposes.

In fact, one day when the gasoline engine did not wor well, the ice plant was operated by the house lighting storage battery.

At the water end of this ice slide is hinged an apron that may be lifted out of the water for re-adjustm It may be lifted by hand and no tackle or overhead rigging is needed. It is simply provided with a foot at the outboard end for resting on the bottom of the pond, which in this instance is rather shallow, being a surface ice pond—advantage having been taken of a natural depression in the ground at a very favorable location for the ice making.

The sections of the runway are number

tively except those in the middle part of the run that are interchangeable with one another; these are all gives the same number.

One of the illustrations shows the method of cutting.

One or the interactions some ten measure of equation.

This small carrier at the low speed at which it runs, was able to handle as much ice as four men could cut. In fact as the carrier was so easily stopped and started it quickly became the practice to run it for a short time

When a motor driven ice saw has be which will be constructed on the plan of the electric floor surfacing machine and may be drawn or pushed about over the ice, this method of harvesting will be quite simplified and doubtless would require only two men to handle, say, one hundred to three hundred tons as might be required on any fair sized farm not equipped with an artificial refrigeration plant.

A peculiar coincidence of this interesting installation is that the relative location of the ice house, the near-ness of a suitable depression for the pond, and the need for a new method at my own farm are so mark-edly like the conditions obtaining here that I believe the outfit would be equally serviceable if moved from one place to the other, so simple and useful is the

#### Labor-saving Devices for the Home

By Hayner H. Gordon, Ph.D., of the U. S. Patent Office

STUDY all the hunting and fighting implements from the stone age to the present time, and you will find that each instrument of death was adopted in turn because of its labor saving character. The same holds od in all arts. It appears in the art of illumination evolved from the pine torch. Man found that with its light he could accomplish tasks at night which formerly he could do only during daylight. formerly he could do only during daylight. He thus became more efficient, and the pine torch, therefore, became a labor-saving device. And the electric light of to-day is after all a labor-saving device just as the pine torch of olden time.

The purpose of this article is to treat of a few laborsaving devices for the home. It would, of course, be impossible in any one article or a series of articles, even to touch on the great multitude of devices of this character. In connection with the home as with the world in general it should be stated that electricity is perhaps the greatest servant of all. We only have to stop and think what life would be to-day without the telephone or telegraph or the electric light. The science of electricity has had more to do in reaching the present state of civilization than all the other sciences put together.

The Electric Fireless Cooker.

The modern electric cooker or stove with its time and temperature control, apparently leaves nothing more to be done in the culinary line, unless perhaps horticulturist invents self-cooking vegetal The fireless cooker, which has come into use during the last six years, is a wonderful labor-saving device for the housewife, but all the fireless cooker did was simply to utilize the heat units to the fullest extent, given to the food before being placed therein. The electhe store or cooker goes one step farther and gives the necessary heat units for cooking to the food while placed in the cooker. In brief, the electric stove consists of two heating chambers built as a unit upon the heat insulation principle. Built into the door of each chamber, is a thermometer controlling an adjustable electric switch which may be set to open at any de sired temperature This switch controls the curr supply to the heating element of that chamber. In series with the chamber-controlling switches, is a mas ter switch under control of an alarm clock, which may be set to close the switches at any desired time. With this stove the preparation of a full dinner becomes a simple matter. The prepared vegetables are placed in one compartment, the thermometer being set to boiling temperature; the ment is placed in the other compartment, that temperature being set to reasting tem-perature. The housewife then sets the clock to turn on the current at the proper time, and goes off to the matinee or spends the afternoon shopping with some friend At the proper time the clock switches on the current, and the respective themesuscurers regulate the current, as at so supply just excitely the proper amount of heat to each compartment. Day, spinutes before It is said that the con-type are so well bearing. Cross them then bear a lamp; and with the the

the trace are a second of compacting as to top of the store his which assume local ercolators may be sharked.

The imagered Vacuum Cleaner.
Perhaps no other direct has come into me so in the household recently, as the vacual Perhaps no other division has come into read common use in the household recently, as the wanged without the free cleaners are made in two gainered types by the household, the first of these being the stationary type, which is generally feasibled in the heamment of the bottes, and a sotiating step line unto seed four or room where an outsid to placed. The vacuum cleaner constitute of three principal parts; the deat think, the pump, and the driving motion. In the type fast mentance, the dust task consists of a steel task about three feet high and a shoul and one half is discovered. The art enters the log- of the tank from the spin line and passes down though a couled those electh funded to the bottom of the tank from which it is drawn by a roctary sention penns driven by a \$4 or ¼ horse-power motor. The time removed by the cleaner is caught in the choses electh funded out from the sent the country of the control of the tank from the tentre of the tank o power motor. The dust removed by the creater is accupit in the choses eloch funnel and emptied out from time to time. The other type of cleaner is the portable type. This consists of much the same arrangement on a smaller scale and placed upon casters, the electric driving motor being connected by means of a flexible cord with any lamp-nocket. The vacuum pumps used are of the beliews type, and consist of two boards hinged together at one and and fastened together at the edges by a leather strip, in a manner similar to the old blacksmith's beliews. One board is stationary and the other is swung back and forth by a crank driven by the motor. This type of pump is not used curves by the motor. Ann type or pump as account of the motor of the trouble was caused by the wearing out and cracking of the leather. The latiest type of pump consists of an impaller wheel or fan placed in a close fitting cylindrical ousing

and driven at high speed by the motor; the air is drawn in at the center and thrown out at the peridrawn in at the center and thrown out at the per-phery. This type of pump has no wearing parts except the bearings, which are generally provided with some automatic oiling device. The vacuum cleaners are equipped with a suction hose and a variety of noseds for different types of cleaning. The motor used in connection with the portable type of cleaners uses only a few cents worth of electricity per hour so that the cost of cleaning is low.

Hot-water Heaters.

A hot-water heater at first sight may not appear to be distinctly a labor-saving device. But when we stop to think of the days of our grandfathers when the beath rub was a luxury and all the hot water for the bath or the laundry had to be heated by means of a soal or wood fire, we can see how the time-saving, and, therefore, labor-saving idea unters into connection with the modern hot-water heating system. The newest type of hot-water heater in practical use is of the automate type, giving untilinated not water at any time of day or night upon the turn of the fauest. This heater consists of a long copper heating cell through which the water passes on its way to the hot-water fauest; undermath this-colls is a series of gas burgies operating upon the Bussess or blue finms principle. The gas pressure is requisited by a desule form of control; the pressure vater regularing the supply of gas to the burger by means of the flow of the water, and a thermostat control regulating the gas by the tempera-ture of the water, When a bot-water faunct connected with the sprisen is repeated, the preparts upon a dis-plaragm in reduced aget the gas is turned on; the stath burner being lighted from a small pilot fiame which is kept burning. The water is heated, as it russ shrough the colls, to a temperature corresponding to that in which the thermostat is set. It is stated that the effiatic type, giving unlimited hot water at any numer being lighted from a small pilot fiame which is kept burning. The water is heated, as it ruse shrough the coils, to a temperature corresponding to that ist which the themsetati, to set. It is stated that the sill-cleany of a haster of the trype is over eighty per cent of the total heat value in the mas is dispetly given to the water to interest to temperatures. The, enthersy tank system in which water is hasted by the ordinary type of gas historian and then accommitmed in the tensh, with constant rediscion taking place, has early thirty-five per cent efficiency. A heater of the the tensh, with constant or cleany. A heater of the trype is non-about four epide feet of gas per minute when delivering from cushe feet. Fahr. This type of haster works vary well in conjugation with a heavy-race lands countered to a hot-water into the constant and the successful feet of the bowater discontinum with a heavy-race lands countered to a hot-water country of the state of the counter of the delivery of the state and the successful feet of the bowater discontinum than believe in delivery the successful feet the bowater discontinum than believe in delivery the successful feet the bowater discontinum than the state and the feet of the state and the water in over 160 and Taplis, the thermonist constitutions

champer, the sewret of their is very law to the allowed to flow opin the wight of her. This cools the thember an takes by its darray of ampoints got matter of the liquid amnoths instanted to the liquid amnoths instanted to the liquid amnoths in a sec, with a consequent cooling.

tor, with a consequent cooling of the recess is then ready to be repeated.

The control of this device is semi-cut. The control of this service is sent-eutomatich. When the leaves it his edds of the los hos is raised the sequent of heat is turned on. If electricity is used a switch, its closed by this means. If gas is the source of energy, a valve is depend, and the burner under the tank in lighted from a pilot fame. When the tank its heated secough to drive off all the gas from the water, a thereenough to fetive off all the gas from the water, a thermost releases the weight of the lower, which then falls, shutting off the source of heat; and starting the falls shutting of the source of heat; and starting the falls over condensing water. We, therefore, have a definite amount of refriguration for each liftful weight et he lever. Bach operation of the device is actually equivalent to placing so many pounds of feel in the form of the starting the fall of the sour is much cheaper and more efficient than the prifinary reme of the hort, but it will producing the some time type of ice box, but it will probably be some before we can hear the modern housewife tell servant, to see if the ice box is lighted, without

ing that concetting is wrong.

Labor-saving Cleaning Mackinery.

With the four labor-saving devices just described, the work of the housewise has been issued to a great degree, but the multitude of smaller devices have consted much more to making the life of the b wife easier. The routine honeswork of the we the modern up-to-date home has been much simplified.
On Monday, the weathing is done in a patent weathing machine run either by electricity or a small water motor. The clothes are then wrung out in a motor-

Tuesday, the ironing is done not as it used to be with researy, the ironing is come not as it used to be with a hot fire in the store and the swelering heat of the kitchen laundry, but with cool gas or electric irons. There are also small gas mangles for ironing such things as collete and outle at home, so that the modern

Wednesday, is monding day and the hot Wednesday, is mending day and the honosevice, or course, brings into use the sowing machine, but the sewing nanchine of to-day is different from that of passedary; for now it is driven by a small selectic moter, the speed of which is requisted by the pressure of the foot and the full set of attackmants for the darming of stockings, working button holes, brakling, and embroidering may be used with a machine, Thurnwisty, is calling or matines day. Friday, the vartum relasary comes into use, together

Friday, the vacuum cleaner comes into use, togeth with the dustiess dust cloths which are just beginn to appear. The silverware is also polished by use

or appear. The surveyare is also pounted by means of a small clockrid motor.

Saturday, is baking day, and the new algorithms conditing and haking intensits are used in conjunction with the gail or electric store.

Then follows Sunday, the day of rest;

#### The Bull of the Oldest Novemapor in the World

is provident of the Chinese Republic, Ton East resently suppressed the histograper SI is millionistic was the oldest paper in the which substituting was the clear paper for (300 years it has reported the me mayor and pale of China, but also of fore far a time of the clear at the clear that the control of the clear at the clear a

A floor Mathest of Weathing Controls to Enchape

A floor Mathest of Weathing Controls to Enchape

A floor Mathest of the Summariae Dive

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spired dives, and was unable to straightum out his machine again before he struck the ground.

Recently, in Flight, Lieux, Parke, of England, de-sorthed how he and a companion, while doing a spiral dive, found the banking becoming steeper and an escepa-and the dive ever mote abrupt. Despite the warping of the winger to the limit to stop the tipping, and the turning of the rudder inward toward the center of the terring of the readice inward poward to scenter of the offects, and of the elevator upward to make the machine rise, movements outerinstity made when spiraling, the machine was evidently completely out of his control and both men believed themselves doomed. When shoots fifty rist from the earth, Lieut, Parto, acadesis-sity termed his vertical radder in the opposite direcand both men believed themselves doomed. When about fifty retrie rou the cartit, Lieut. Parks escaledarily turned his vertical radder in the opposite direction, ordered intend of hursd, and instantly his highest ease out of the intend and called off on a level had. Evenly, there witnesses who saw Poul's radder turned outwind, would indicate this this young flyer had havel of said diff, aprily Lieut. Factor around to an amountained spiral. First if it worked in one case, why did it not opt in the officer The reason no avisons said to be a said of the called and the said of the called and discusses in said to the called and discusses in said of the called and discusses into the called and discusses into the called and discusses into the called and discusses the first of the called and the called and the called and discusses the first of the called and the called and

Finally, geroscopic force should not be used to ex-sin sendants in which it cannot possibly have acted. Now York. STANLEY Y. BRACH. lain saudani Noti Taik

#### · Determinism v. Freewill

To the Editor of the SCIENTIFIC AMERICA

"To see season or tas scenarize Assence."

In your issue of August 31st C. H. K. quotes Dr. Johason as saying: "filt, we know our will is free and there's an used out; all theory is against the freedom of the will, all experience for it."

That was just the the good old Doctor, but would it not have been about as logical for him to have said. "filt, we know the sun goes around the earth and there's an end on it; all, theory is against the old belief, all experience for it?"

experience for it?"

Let us first get clear on this supposed antagonism of Theory and Experience. In a strict and scientific sense experience supposed the source of all our knowledge and the foundation of all truth, and when a theory is shown to be at variance with experience it is abandoned an accordant when the has meaned use of the word experience. or modified, but in the general use of the word experi-ence may be said to be also the source of all our errors ence may be sent to ten hope and the source or an our errors and illusions. It often happens that theory is true and that superistne, so called, is false or misleading. When a thatory is a logical deduction from a proven law, then the "apperiance" which is contradictory stands for correction, because it really conflicts with the vast and vertically an area which the soil law is because fled experience upon which the said law is based.

This apparent paradox is of course due to our con-sion of experience and inference. For instance, the struction of matter was a daily "experience" until fusion of experies sessurcesses of matter was a many "experience" intil science proved it an impossibility. Now we understand that only the disappearance of matter was the real experience, destruction was an incorrect but common

This set of discriminating between our setual experi-This not we meeting the property of the country of that is much more commendable than it is com-

Now the Determinist takes the position that his doctrine is an exact logical deduction from an established law, namely, the Persistence of Force, or the law of Cause and Effect, as most of us call it, the most fundamenta of all our accepted generalizations; therefore, if he is correct, it accords with universal experience; and he points out, as I believe Schopenhauer suggested, that the apparent freedom of the will is an illusion due to our susciousness of the emotional processes which result in edision and action—a self-consciousness which is, at toost, very superficial.

The Determinist further argues that his doctrine

accords more directly with experience. People act in the same way under the same circumstances, or, when they do not, we say that some are "differently consti-tuted," which is only saying that the circumstances are different. Otherwise there could be no social order. mes for Determinism.

Freewill would be psychical Chaos. It is, in fact, unthinkable. Determinism is at least conceivable. It is seographed in our laws and customs. It pervades our very-day speech. "We do as we will, that is as we wish," yes, in fact we do nothing else. When we act, as say, contrary to our desire, we mean only that a meter or higher desire than any which first swayed our We say, or minds is setting within us. We expect no heroism from one who has not "got it in him." If we are sometimes d and proven to be wrong, we admit our mistak and apologisa. We can conceive of no same person doing anything without a reasonable motive. The entire

doing snything without a reasonable motive. The entire hampens of reasonable motive is accepted by us a prime feste ordinance of inguity—and there we are still scknowledging Determinism.

Will, in practice, may be said to be the algebraic sum of the various desires involved. Action, inaction, or adverse aprion follow as the resultant "sign" is positive, utral, or negative.

It is not necessary that we explain all the strange abe aliess of the individual mind or the many seeming necessitable acts of men, any more than it is require that of the transfer of the tr neity of Motion in the physical world.

There is not question which the advocate of Freewill impossiblely salt, with the air of making a posse for the Committee; "What about moral responsibility? this "Bediemetisky: "What about moral responsibility to the first sound is no monal responsibility associating to the detect initial positions, there'energy argument of administration of placetic facilities, and placetic facilities and placetic facilities, and placetic facilities and constitutions to follow them until we can do constitution and constitutions to follow them until we can do

Acres a stuffishes the worldge we will substitute a more

scientific method than that of stimulating fear in order to deter men from vice and crime, a crude and un factory method at best. As we become more scientific, our administration of justice will merge into a prevention of injustice. Our corrective methods for social sylls will become more rational and more efficient, and nothing is doing more to prepare men's minds for the acceptance of this much-to-be-desired social plan than the spread of the doctrine of Determinism. It underlies every real advance made in educational methods and the spread of social welfare.

To paraphrase Prof. Jacques Loeb in a recent article in the Popular Science Monthly upon the m compared with the vitalistic conception of life: When ven the advocate of Freewill wishes to contribute any thing more valuable to us than mere argument or rheoceeds upon the assumption of Determ

Where the adherent of the doctrine of Freewill in practice has neglected or ignored the facts, trusted to o or Providence, extled, persecuted, maimed, and murdered the children of men—and failed—the Determinist in practice will study the facts, readjust conditions, forestall degeneration, nourish, train, and succeed.

Determinism is only one phase of that simple Faith which grows stronger with every advance in knowle and which is the guide and inspiration of the scientific investigator in every field—the belief in the Uniformity of Nature. J. E. STINSON.

Wichita, Kan.

#### The Rail Problem

To the Editor of the SCIENTIFIC AMERICAN: In your issue of August 10th, 1912, I read that a Public Service Commission has pronounced excessive speed as the cause of broken rails on our railroads.

It looks very much like an acknowledgment of on the part of our engineering experts, if this failure cannot be prevented except by reducing speeds—a means of last resort.

Is it not possible that they have been looking for the fault in the wrong place? This fault may be in the rails, the roadbed or the rolling-stock. The first two places have been probed, and many faults found and corrected, but still the rails continue to break. But, as regards the rolling-stock. I do not believe that a single change has been made or suggested, with a particular view to

prevent the failure in question.

Reducing the weight of the rolling-stock would also be an acknowledgment of defeat by engineers and inventors, and should not be considered so early in the

If attention be directed to the rolling-stock, it is at once noticed that the load of the train is very un-evenly distributed over the rails, through the medium of the trucks or wheels. The load should be so distributed that the rails, when once loaded, would not be relieved until the last pair of wheels of the train had pass

Under the present manner of distribution, the rails are alternately loaded and unloaded, as the wheels pass over—once fully or twice partially—in the passage of each individual car in the train. This involves repeated bending of the rail, which must tax the fastenings, and ultimately cause a weakening and breaking of the rail, because of crystallization.

Decause or, crystamization.

To carry out this suggested change, it would be necessary to build shorter cars and increase the wheelbase of the trucks. Instead of shorter cars, however, an additional truck could be provided, which would be sandinan trues could be protect, which would be placed midway between those as they are at present, disposed at either end of the ear. To provide for round-ing curves, the flanges could be left off these additional wheels or provision made for lateral movement.

With this reconstruction, the individual pairs of wheels throughout the entire train would be equaliv spaced and a perfectly uniform distribution of the load obtained; and instead of subjecting the rails to repeated shocks, during the passage of a long train, this would be reduced to unity—or the fluctuations rendered so light as to be harmle

Chicago III

#### A Plan for Utilizing the Sahara Desert

To the Editor of the SCIENTIFIC AMERICAN: I was very much interested in your recent article, "Converting the Sahara Desert into a Sea," and from the

description given of the engineering features, it seems to a "rank outsider" that instead of making a great inland sea it would be far better to make a series of irrigation and navigable canals and possibly small lakes in low areas in which the quantity of water could be regula to a nicety by gates or locks in the intake canal, as well as with others along the line where needed.

is would not cover up hundreds of thous scree of the best and most fertile land, and the small ntity of water would not disturb the "earth's equifum" nor be a danger of making climatic changes in tops, both of which were mentioned as objections to

W. P. MEGRAIL, M.D.

## Labor-saving Duplicating Machines for the Office

#### A Review of Methods Old and New

By H. S. McCormack

A SK a dosen business men what in their on the market and you will probably receive a dosen different replies. Each business man is invariably guided by his own experience. If the man to whom that question be put happens to be a relirored man, he may recommend the mud duplicator, because in his department the duplicator he recommends is possibly the best of all.

The "mud duplicator" is known to the trade by the more refined name of the "clay process," and is furnished usually in metal trays, but in some of the steel mills and railroad offices the "mud" or "clay," as it is called, is purchased in bulk, usually in kegs.

"ciay" as it is cause, is purenseed in bulk, usually in kegs.

When purchased in bulk the clay is spread out on tables to the thickness of one half or three quarters of an inch the table being fitted with an inch beading around the edge, but it must be understood that in most such "copping of faces" good clothes are unknown.

This clay material resembles putty to

This clay material resembles putty to some extent and has about the same consistency, while the color is not unlike that of putty.

#### How the "Mad" Duplicator Works.

After being spread out on the flat surface a wet sponge is used to moisten the clay; after which the sheet to be copied asciary after which the sheet to be copied asment to be copied or duplicated has previously been prepared with either duplicating tak or a duplicating ribbon; consequently, when the document is laid flat and rubbed gently down on the sunoch surface for the purpose of eliminating wrinkles and air spaces, the damp clay receives the impression.

The paper is left for a minute or two
and is then pulled off. Upon the surface
of the drab colored clay is the inked formation of the work to be duplicated.

Immediately after the original copy has been removed, fresh plain sheets are applied quickly and smoothed out, usually by hand, and are immediately pulled off. Thus a few good legible copies are secured. Now the motatemed sponge is brought into play, and all trace of the copy is washed off and a new copy is stamped on immediately and the operation revented.

For securing from three to six or eight copies of a shop order or for securing copies of way-hills, etc., the clay process has the advantage of being inexpensive and very rapid and, aithough an old process, there has been nothing found that would quite take its place for quick and inexpensive results.

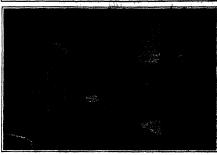
#### The Gelatine Pad.

Following the "clay process" came the "gelatine pad," or the Hitte th rays or july cake that in which was poured a golatine composition, which was a very clean and refined method for securing a few duplicate copies. A graaf many companies sprang into existence and began to furnish golatine copying pads, with the result that thousands of gelatine time were sold to business time all over the country, but the best known process was the old "bestrograph," which is still it existence. Despite the wonderful strides made in the set of duplicating, there remains to-day a certain demand for duplicating work of this character.

work or this character.

Then came the typewriter, followed by typewriter carbon copies. The results of the first carbon sheets were anything but satisfactory, and it is hard to-day to real-ties how mussy and samingly waves the carbon sheets at the time the first typewriters were included. Soon improvements were made in the carbon paper. Then came the heltograph typewriter ribbens,

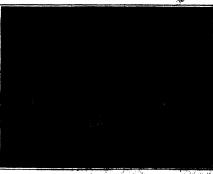
The requirements of business have made it necessary to dealer quick, these ones successful processes for digitionisms handwriting and typewriting. In the last teently-five years the nimber of despication described an antisplace intelligible on the last teently-five years the name of the objects is explicit. And yet despication in a business smale is still in its infrança. Much remote still to be donn. The following urthous, critica by a well-income expert on bisiness affordary well office intenagement, describes brings the principal despicating machines more in use. As a revises of the state of the other of the other dispersaments which are still needed.—Extra neede



With the mimeograph copies are produced in large numbers of such a character that they can be successfully med for circularising.



An inventor has designed this machine to provide a mechanical means of setting up type faces. The printing mechanism is equipped with a reli of paper which is cut off its suitable lengths when the machine is operated.



This machine duplicates a signature many times. Without it the new stack

which asserted up the executor, the eleboy, and sometimes ruled the disposition of the "boss." Finally the art of manufacturing the proper ribbits was facuned with cutte satisfactory results.

when this time the haltograph saries: was introduced, and while the number of legible copies was reduced, the cleanliness of the carbon, as sompared to the ribbon, was an element in its favor.

ribbon, was an element in its favor. Next came the war trainfell sheet. In this connection the likeling of A. B. Dick, who was engaged in the lumber business at the time, is inferenting in trent, as he was the ploneer used of the war principle, and his highly perfected war sheet and fink supplies will go down as his extra the pick-Hearty case has extra the property of the propert

How the Wax Stencii Sheet Deplicates. The stencii, as now used in the process of deplicating autographic work, is made on a sheet of fine, specially manufactured timps paper coated on one ofte, with a ligh of wax or very sensitive material.

The certific agent of the mimeograph is a plate of fine tool steel upon which are cut intersecting corregations numbering two hundred to the inch, thes making on the plate a surface of small sharp points, so fine and minute that a magnifying issue is required to bring them distinctly to the eye. Upon this steel plate (which is sumbedded in a table of polished slate) the sheet of sensitive paper is placed, and the stencil is formed by writing on the

Upon this steel plate (which is sunhedded in a table of polisized size; the sheet of sensitive paper is placed, and the stend is formed by writing on the paper over the steel plate with a finepointed stripe which is made of tempered steel. As this strius passes over the sensitive paper, it presses it against and upon the steel plate, and the fine sharp points puncture it from the under side, making a series of ordices or holes, seen one a two bundedth part of an inch from the next, in the lines of the writting. The point of the strius, although therefore to the size of a nicely sharpened lead pencil, really resto no three of the cutting points of the writing plate at one time. It thus gives mad by and smoothly over the respect of the stripe of the stripe of the spect of the stripe of the stripe of the spect of the stripe of the stripe of the paper. Our stripe of the stripe of the paper of the stripe of the stripe of the paper. Our stripe of the stripe of the paper of the stripe of the stripe of the paper of the stripe of the stripe of the paper of the stripe of the stripe of the paper of the stripe of the stripe of the paper of the stripe of the stripe of the paper of the stripe of the stripe of the stripe of the paper of the stripe of

With the advent of typewriters, experiments were first made with sand-paper behind the wax sheet, and then ensery cloth; but the attempts were very unsatisfactory until the present method was discovered, i. e., the use of a sheet of specially prepared etencil paper (made from open woven Japanese fiber similar to a lady's well), back of which is placed to place of very fine bolting cloth or open fibrous paper, both being inserted in the typewriter and written upon in the same way as an ordinary letter is produced, with the exception that no ribbon whatescreeg is used.

The stencil is made by striking the type resistent the stand.

The stroot is made by striking the type aguiest the stend! sheet, and in doing this the wax coating is given from the stageth abest into the bolting cloth or diverse backing in the times of the characters in struck; in other words, the typewritten stend is made by removing the written stends in the struck.

terial where the type has struck.

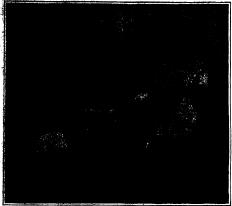
The missecurate was the set displicating system which produced copies in self-ficient numbers of a grade which gave them a commercial value for circularia-

White the mineograph was going through the early stages of depalerment there was prompte from the other add-

This side-sighthood dispresses bed, with a activate of this type-refiler, become more pitter than way. Now came a demand of the by presses, The raffronds used up desent of things add secured a done make at a time, but there was a demand of it larger number of oppies and for the oppies, with they rewill the numer a tipe-refiler oppies, with they rewill the numer a tipe-refiler were striving to supply the

#### The Typesviter Duplicator.

Rissily, the type displicator was introcod. This was realty a portable printig gees composed of a fat hed with a
il or platen running over the printers'
ase, which was filled with the regular
sadard printers' type. The advantage
the outfit was mainly that it was
tipped with a typewriter ribbon; conquently, the impression secured was a
off initiation of typewriter work.
This attempt at duplication was fol-



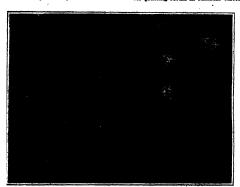
A flat-bed type of duplicator using foundry type, electron, etc., of standard size. These machines provide means for duplicating typewritten letters or for printing forms in business offices.

lowed by type lined up in cylinders, metal druns, and these little types, we their different faces, were in groot channels opposite a revolving typehold which permitted the type from the s ply drum to be set up in letter for When a letter form was completed a z bon was stretched over the whole a the handle turned, with the result th displicate letters were turned out wholesale quantities.

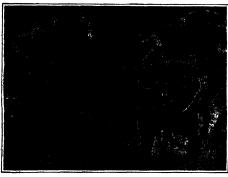
Then came a demand for a fewer nu ber of copies—one copy of a document instrument—in some cases, two copi This was especially desired by insuran companies where it was customary to coriginal insurance applications by hal Insurance companies found it necesses to copy insurance applications for use adjusting or contesting cases, but the s, tem of copying by hand was cumbersor full of delays and expensive, while the errors in copying resulted ofttimes considerable loss.

Making Duplicates by Photography.
This demand brought about a plue graphic method, or a self-contained pho graphing outfit, which reduced the cost copying by hand and produced in a finitutes, instead of a few hours, a treopy of the original papers.

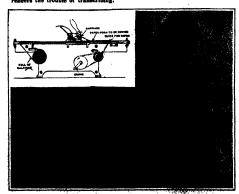
(Concluded on page \$10.)



This remarkable photographic device delivers within a few minutes a duplicate of a design or drawing. It photographically represents a place or machinery or a sample carbono or supplies a photograph of a new lace curtain. Libraries use it extensively for copying whole pages of books to save readers the trouble of transcribing.



The multigraph is an instrument which duplicates by means of type lined up in cylinders or metal drums, which little types, with their different faces, lis in grooved channels opposite a revolving type holder. A ribbon is stretched across the completed letter form, a handle is turned, and duplicate letters are turned out in large quantities.



A displication that makes from one to seventy dive oppositions, who haster sheet.—The significate leads (consider of a rigid frame oppositions, a flat steel bud, over which travole a cheat of highly absorbed goldstan. It issues of a freeding contrage, the original or manche cheat is brought at instance of the goldstan hand, which takes an amount impression of the goldstan matter, then, by forbidgy, finished shows in the manner manner, copied year produced. After one goodstay of the forbids have in the manner manner, capit was produced. After one goodstay of the forbids have in the manner manner, capital year produced. After one goodstay of the forbids have in the manner manner, capital year of the produced of the contrage a hardward within a submissible of the say the up to continue or with



A combination letter-writing and addressing machine.—The machine automatically produces complete typewritten letters, each with a different name and address. Superfect the proper salutation—in one operation. The complete latter is printed through a single ribbon—so that the "match" is absolutely perfect. The machine can be equipped with an automatic aking attachment permitting the skipping or printing of any combination of lists up to eight classifications. Both segments and address plates are set up by means of a vapid automatic typesetter.

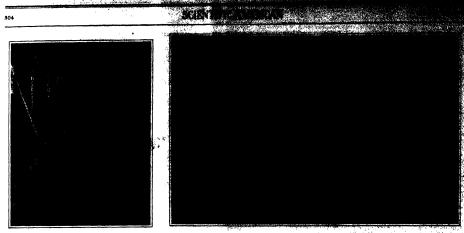


Fig. 1.-Drilling thirty-two holes simultaneously.

#### Labor-saving Devices That Produce Automobiles

Multiple Production and Its Influence on Automobile Prices

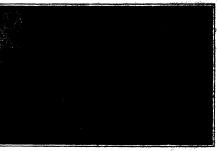
By Theodore M. R. von Keler

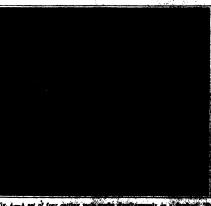
THE first step in sending the automo-hist-co-be on its winding path through furnaces, lathes, drills and stamping machines maxurally is the purchase of materials. This work is handled by the purchase of department, where a system of records is kept which allows instant determination of the exact time when the parts or materials ordered are due to arrive at the factory. If there is any hitch in the shipping from the manufacturers of raw materials, "chaseers" are sent to them and things are "installed" along. A "chaser" is a man whose sole duty it is to take burried railroad trips to the tarrying cetablishments and to impress upon their managers in as forcible as manner as possible the necessity of "getting a move on." THE first step in sending the automo

gers in as forcible a manner as possible the necessity of "getting a move on." The steel ingots, sheets, wood wheels, "live" axles, ball and roller bearings and all the other thousand-and-one large and small bits of metal and wood having been received, the future automobile begins to received, the luttre autonome begins to rise out of the chaos, not in a single unit, but in lots of a thousand or more. At one end of the huge factory an immense drop force gives a few "loving taps" to an un-wieldy steel bar, and lol a side frame member of the chassis is born. Another forge close by, at the same time, turns out end

close by, at the same time, turns out end members, and before you realize it, there are a dozen or more complete chassis frames standing alongside of you. A little farther down the line of huge machines there stands a big forey which by a single blow turns out a front axle for the car-to-bo, the steel bar, of course, having been treated before it reached the having been treated before it reached the machining shop. And so on and on. Everywhere stand whole batteries of machines which do nothing all day long but strike a terrife blow every minute or so, or which lift a part to be machined against a multiple drill, the man in charge being so appert in his particular duties that he barely casts a glanco on his work now and then. The machines work auto-natically and with the least amount of energy to the attending operator. Take for instance the multiple drilling machine shown in Fig. 1. In a single

Take for instance the multiple drilling machine shown in Fig. 1. In a single upward movement of the table on which the crankosae rests, histry-two holes are drilled simultaneously in less time than it takes to drill a single hole in an ordinary machine from a center punch mark. The casting itself is held securely in a special jig. in such a pecifican as to fotpe





lamped in the pivoted arm ut a few minutes.

ders. The milling on this mackine is the first operation on the rough cylinder easings, as they come from the foundry. Another hig machine, shown in Fig. 3. illustrates how four exastoness are machined in a single movement of the bed on which they rost, while Fig. 3 shows how the crasheases are bosed for consolate the single movement of the bed on which they rost, while Fig. 3 shows how the crasheases are bosed for consolate the same of the first the same of a fig. One is involuntately reminded of a connexy in which fruit is consol, when one sees the huge "paring" machines at work. There is one that stiently, and yet tra-siettly, shaves steed from a rough comment of the first transpired and control of the first of the control of t

But influenced by the spirit mentification for of the qualities parts in it is unablest to them, until selection parts in it is unablest to them, until selection parts in it is unablest to the control of the selection and the selection may be a selected or the selection modelline. Beith one perhebby make, and while the sufficient of the parts are not allowed to the modelling and circles modelline or builded or to walk alone to change with their including the tip mandating department, of the modelline partner to the modelline partner than to find call with the work of these partners, the has modelline partners, and patterns, which reject automatically may and away piston found defective or light, to the imprehension over on night A platen weighing but a few grains more than its "partners" in a four or macrojine motor may seriously interfers with the amonth working of the merits.

lights, to the imperfection ever so slight A pleson weights plus a four- or mo-crylin-dee motor may seen such interfere with the smooth working of the engine. There are still more accurate gages used for testing ball and roller bearings. Be difficult is the production of these that the bulk of it is earlied on in special factories equipped with the most inserted costing testiments known. One of these is aboven in Fig. 7 and is used for gaging the size and weight of rollers used in rebet bearings. The rollers are fed into a horizontal original from which they are sent on an endless belt between the poles of electric testices. When they pass one in which they meet all the requirements as to thickness and weight contact in established, a trap door opens and they drop into a receptable placed below that particular tester. The ones shown below held rollers of certain suce and weight, thore bodny sixteen of them on each testing machine

ting machine. In another machine the hardness of the steel used in wrate pine and other important small parts of the our is seried. This machine is a selectorous in tomatic of a graduated glass tube through which a hard steel ball is dropped upon the steel and isomose back into the table. As it is always dropped from the same height, the degree of its homes the same of the steel.

Crankshafts are placed upon infellion of the same of a series of the same of t

Craninharta are placed upon imite-like edges and unred at every possible angle. They must remain stationary in any position. If they cauve the least fraction of an inch thay are rejected as imperiod and out of behance. The men who do the testing are superais in their line. Supermentive care added to highly developed powers of observations mable them to discover importantions in a major which the layrana could not notice, ones after they are pointed out to him. There are man who do one paysimize appending ay in and day, out who respect it is shoulding times a day, year perhaps a sufficient families at high one than the property of the country o

Desirable that offeres of the familiary, and the very serve of the particular planes, made the production of the particular planes, and the production of the last beginning and the particular planes of the familiary and the particular planes of the particular planes.



eres savinadas

Fig. 6.... A single day's enjant of motors used in one of the cheapest cars on the market. In order that the casemare may receive a motor that is an perfect as investments one spinish 3, it is subjected to the tests of gages and balances which reject antiquationally any and every platen found defective or light, be the imperfection over no slight.

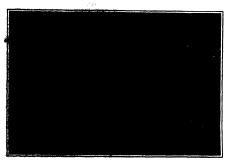


Fig. 6.—This is about one quarter of a day's output in whoels for a Detroit manufacturing from Like other parts of an automobile, wheels are not only made by the thousand, but are carefully imported and tested before they are fitted to the axion of the cuts which they are intended to support.

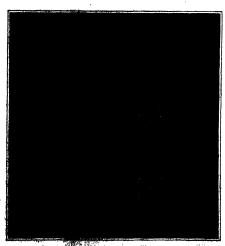


Fig. 7.—Twelling railed for the security is shortfeel testing uniquine. The reflexs are asserted in the same size are despend into one off. There are extrem case for sixteen different zize, varying from one cases are six for into the first zize, varying from one cases for six for the case way by only 1/286 of an Inch. The largest and smallest class way by only 1/286 of an Inch.

quite another thing to so adjust the remainder of the factory and the sales end of the enterprise, to take full advantage of the efficiency of the machinery. The human factor in such an organization is still too large to be ignored, and the administration and selling end of the same are fully as interesting than the mere mechanical production.

#### Chill-proof Beer

N O subject has engaged the efforts of the brewers in recent years more than the problem of brewing a chili-proof bottle beer that will stay brilliant and retain its original flavor and taste when chilled to low temperatures. Beer is very sensitive, even diffused daylight affecting its taske and color unfavorably. Pasteurisation, where of the derivation, excits a detrimental influence on the beer and increases its sensitiveness. Not only light, but also low temperatures affect the beer injuriously. Bottled beer deteriorates in time. If, after ten days to two months, the bottles are chilled by placing them on ice, their

contents become hazy or cloudy.

Beer contains from 2.5 to 8 per cent of alcohol, 3 to 6 per cent of carbonic acid gas, and from 6 to 10 per cent extract, including about 0.4 per cent of albuminoids. It was found that the turbidity of the beer was due to a part of these albuminoids, which, on chilling, became in-soluble. These albuminoids are of a highly complex molecular constitution, and the sensitiveness of the beer is due and the sensitiveness of the beer is due to their presence. Bottles made of brown glass protect the beer from the actinic rays of light, but do not prevent haziness on chilling. It may be supposed that the problem was easy of solution by chilling beer almost to the freezing point and filtering. However, it seems that the albuminoids of the beer constantly undergo slight changes, and beer, carefully filtered when cold, will again become cloudy when subjected to chilling a second time.

The problem was attacked from many sides. Efforts were made to modify the albuminoids in the mash tub; by removing as much as possible the albuminoids of the beer; by restricting their introduction in the mash tub. However, since malt contains soluble albuminoids which enter the beer wort, the evil could not entirely be overcome. Furthermore, beer containing few albuminoids deviates from keeping qualities are impaired and it lacks what the brewer calls zest and palatefulness. Neither were special methods of fermentation of any avail

At last the problem has been successfully solved; bottled beer is now put on the market which stays perfectly clear and brilliant even after staying on ice for days and weeks

The solution consists in rendering the albuminoids permanently soluble, in di-gesting them, as it were, by breaking down the highly molecular albuminoids into lower albuminous compounds, such as albumose, peptones, and amino acids. This is done by adding to the beer a minute quantity of a proteolytic enzym, as little as one gramme per barrel of beer being sufficient. Enzyms are organic ferments: they are nitrogenous compounds of complex structure, which by their mere pres-ence are able to effect chemical changes in organic substances without undergoing any change themselves in other words they are catalyzers. The study of enzyms is extremely difficult. Enzyms usually occur in mixtures with other enzyms, and it is practically impossible to separate them without decomposition. Boiling, or even lower temperatures, will coagulate them; the presence of traces of certain sale etc., will inhibit their action, while other saits will energize them. Malt and yeast contain a large number of enzyms, one of which is peptose, a protectivitic enzym, capable of dissolving and modifying albuminoids. In employing enzyms derived lt or yeast, no substance is introduced into the beer except those derived from the usual brewing materials.

## The Imposing Naval Review at New York

#### The President Reviews Five Miles of United States Warships

THE grand mobilization of the Atlantic Fleet at New York for inspection by the Secretary of the Navy and review by the President of the United States, why and review by the Frestein of the United States, the largest and most important gathering in one place of the ships of the United States Navy that has ever occurred. Last year ninety ships were mobilised at New York whose total tonnage reached 576,684. nt New York whose total tollings the Hudson River 128
Solute of all classes, whose aggregate displacement. ships of all classes, whose aggregate displacement all 220,484 tons. That the people of New York and yisk-ors from the various States will thus have under their eyes, at one and the same time, practically the whole lighting force of the United States Navy, is shown by the fact that the latest official summary of the dis-placement of all this abbut of the United

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placement of all the ships of the United practition of an one amps of the officer States Navy gives the total as 758,499 tons. So that the fleet at New York is only about 38,000 tons short of including ne whole of the effective Navy. The five-mile line of ships will extend

from Thirtieth Street to a point about a mile and a half above Spuyten Duyvil, at the mouth of the Harlem River. The

	Tons
Di	splaceme
31 Battleships	478,50
4 Armored Cruisers	58,000
4 Cruisers	15,56
20 Special Type	55,37
6 Naval Militia Vessels	4,58
8 Fuel Ships	88,38
24 Destroyers	16,94
16 Torpedo Boats	3,02
10 Submarines	

The object of the mobilization and review is two-fold. First It is the hope of the Navy Department that the gathe ing of so many ships of various typ stimulate the interest of the public in the Navy, and that it will give the many thousands of visitors who will go aboard thousands or visitors who will go aboard the ships that more intimate and intelli-gent knowledge of the quality of our Navy, which can be obtained only by a personal inspection of the vessels them-solves. Printed descriptions and published photographs can do much in way of instruction; but far more can be effected by gathering the fleet in one great assemblage, and giving the public every facility to inspect the ships in perevery racinity to inspect the snips in per-son. That these reviews fulfill this pur-pose was proved last year, when it was estimated that many millions of people, not only from New York but from far distant sections of the country, flocked to the banks of the Hudson River to witness the imposing spectacle, and crowded the excursion boats, which took them to the ships or steamed up and down the long lines of anchorage. The second object of the mobilization is to train all the branches of the Navy in co-ordinating and perfecting the many details of preparation, which are involved in the mobilization of such an impressive force.

To those of us who have followed the

growth of our new Navy with close attengrowth of our new Navy wint close atten-tion, it is evident, at a glance, that the long line of warships includes representatives of every year of growth of our new Navy from the date of its birth in the early eighties. The array is so distinctly historical, that there may be found in it representatives of every shipbuilding programme from the time of the famous

White Squadron down to the present year.

Thus, among the battleships, we find the "Indiana" and the "Mussachusetts," which, with the "Oregon," now on the Pacific Coast, formed the first group of inttleships to be built for our Navy. When they appeared, the world was startled by the great weight of their armament, which included four thirteen-inch, eight eight-inch, four six-inch and many smaller rupid-fire pieces. Following them came the "Iowa," which mounts four twelve-inch and eight eight-inch guns. Present at the review, also, are the "Kentucky" and "Kearsarge," which were commissioned just after the Spanish war. These ships carry four thirteen-inch guns, with four eight-inch superimposed above them—these vessels being the first of our ships to carry the double-deck turret. Next in order of age are the "Alabama," "Illinois" and "Wisconsin," the states six-inch gives. The two clauses are read distinguished by their medicatedts, the "Allicain being the only elips is our Navy to carry their succ



Range finder, mounted on turret roof.



ie target is 20 feet high by 30 feet long. Towed at 10 kg Target used in buttle practice.

"New Jersey," "Georgia," Nebraska," and "Rhode Island." These vessels mark a great advance is size and fighting power over the "Maine" claes, and the eightinch gas and the double-deck turret reappear.

inch gas and the double-lock turret resphent.

It may be well, just here, to note the increase in size from the "Oregons" to the "Georgias." The "Oregons" are of 10,288 tons displacement; the "Iowa," gons" are of 10,388 tons displacement; the "flows," 11,410 tons; the "Keenstarge" and "Kentuck;" 13,500; the "Alatisman," 11,562; the "Merines," 12,500; and the "Georgiase" about 15,000 tons. The "Indianas" wire completed in 1905 and the "Georgias" in 1905. There completed in 1905 and the "Georgian" in 1905. There was thus an increase of 30 per cent in the diffusionment of our battledning during the first decade of the new nary. The "Georgian" curry four twelve-lond game in two turrets forward and art, with two eightlends game in two turrets forward and art, with two eightlends two eight-linch game, and there is a secondary bettery to twalve stanch, gapid-fer game. These ships site heavily armored, and they are good to-day for a ministrum speed of 10 kmots.

The "Commerciast" class, which followed the "Georgias," is the last of the pre-freednonging serve. The "Commerciast" the last of the pre-freednonging serve.

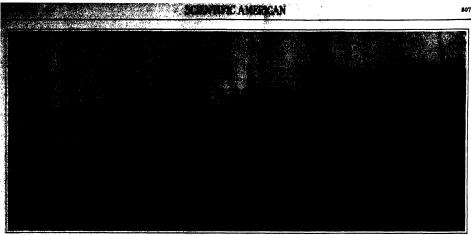
Danied. Congress and here the leaves of the re-possible for this first that the these ships are of only 13,000 tegs, and here the open of the extraction of the leaves of the leaves of the structured of the displacements to thirtons. Increase the displacements to thirtons. Increase the displacements to thirtons. Increase the displacements to the displacement or editions or the "Connection!", reducing the speed and coal supply, and cutting out four of the serve-head gums. With the "South Carolina" and "Michi-ment" convolcted to 1000 one. New morand

with the "South Carolina" and "Michigan" completed in 1989, our Navy entered its dreadnought era. These vessels, of 16,000 tons, are armed exclusively with twelve-inch guns. They carry eight of these in four turrets, two forward and two aft, on the longitudinal center line of the ship. The inhoard guns fire above the roofs of the outboard turrets, and all guns are available on either broadside. guns are available on either broadside.
This principle of mounting, first introduced in these ships, has become practically universal throughout the world.
In their recent speed trials at sea the
"South Carolina" made 19.88 knots and
the "Michigan" 20.01 knots.

in the next class are the "Delaware" and "North Dakota" of 20,000 tons, completed in 1909, and the "Utah" and "Florida" of 21,825 tons, completed in 1911. These four ships mount ten twelve-link fortr-five calling companies. forty-five caliber guns in five turrets, all placed on the center line. The broadside placed on the center line. The Broadside fire consists of ten guns and the forward and aft fire of four guns. The torpod-defense battery consists of fourteen fiv-inch guns in the "Delaware" and "North Dakota" and sixteen of the same caliber in the "Utah" and "Flortda." The former have recently made over 22 knots on their regular annual speed trials. The "Fior-ida" made on her trials over twenty-one knots and the "Utah" over twenty-two

The most interesting ships at the re-riew are, naturally, the "Arkansas" and "Wyoming." They are our latest dreadthey are the first of our ships to mount twelve twelve-inch guns. These are twelve twelve-inch guns. These are mounted in symmetrically-disposed pairs of turrets, with one pair of guns firing above the roof of the adjoining turret. Two turrets are forward on the fore-castle deck, two immediately abaft the mainmast, and

two on the after part of the quarter-deck. These twelve-inch guns are fifty calibers in length, and have twalve-inch guns are surty calibers in length, and have higher velocity and more penetrative power than the forty-five caliber guns of the "Utah" and "Florida:" The secondary battery consists of twenty-one five-inch, fifty-sathley-guns. The designed speed of the ship is 20.5 kines, the cool capacity a 2,500 tons, and 400 tons of cdl says carried. A novel feature in these slips, which is one callabling adds greedly to their appear-ance, is the fact that there is no break in the sheer line of the upper deck, which astern has a freeboard of about 19 feet, and runs with a gradual rice to the of about 10 feet, and runs with a gradual rise to the atom, where the freshored is between twesty-fave and threaty-six feet. One advantage of this arrangement is that the breakfed leatery of few-inde again to spirated several feet higher above the water line than in the presenting vassion, which have a straight sheep and rising downcastle deed. Mext is interest to the battlestips at the harpest, dans, which is a straight contract the several property of the service o



tion by E. Maler.

12. Market 1, 2. Maler.

13. Market 1, 2. Maler.

14. Market 1, 2. Maler.

15. Market 1, 2. Maler.

16. Market 1, 2. Maler.

16. Market 1, 2. Maler.

17. Market 1, 2. Maler.

17. Market 1, 2. Maler.

18. Maler.

18. Maler.

19. w. 11 and 12-inch. Driven by 4-screw Parsons turbine Battleship "Utak;" sister ship is the "Florida;" both in the Review.

hosts have a raised forecastle deck with a freeboard of sixteen feet. They are able to go anywhere on the high seas and endure the severest weather. The est three and four-funnel boats of the "l'atterson" and "Sterrett" type are good for from thirty to thirtythree knots.

The submarines are of the well-known "Holland" type, and perhaps no branch of the navy just now excites greater interest among the naval officers than Looked at askance a few the submarine is now regarded as a formid-able arm of the service, the limit of whose possibilities in future warfare, when it shall have grown in size,

sed and sea-keeping ability, it is difficult to determ speed and sea-resping ability, it is difficult to ossermine. Mention should be made of the division of four armored cruisers, which includes the "Tennessee," "Montana," "Washington" and "North Carolina." These are identical vessels of 14,600 tons displacement and r 22 knots speed. Completed 1907 and 1906, they are being built. Their place has been taken by the modern battle-cruiser, a ship exceeding the battleship in size, and from five to seven knots faster, possessing somewhat less gun power and less heavily armored, but still a vessel capable of lying in the first line of battle. We have none of this type of ship in our Navy, none is being built, nor as far as we know, has a battle-cruiser design been drawn. The "North Caro-linas" battery of four ten-inch and sixteen six-inch guns, and their light armor of five inches maximum thickness, renders them totally unfit to cope with the modern battle-cruisers which mount twelve and thir-

teen-inch guns and carry from seven to nine inches of armor

In concluding this description of the ships present in this imposing review, we wish to express our belief that ship for ship and date for date, our vessels are fully the equal of, and in battery power the superiors of the average fighting ships of the same classes in the navies of to-day. Particularly powerful is our battleship fleet in gun-power. We believe that the vessels of the "Connecticut" and "Georgia" classes are more than a match for the pre-dreadnought ships of other navies; indeed, because of their heavy armor, they would be able to lie in line against any of the inch gun dreadnoughts of foreign powers

The weak points of the fleet that lies in the Hudson River, if there be any, are its lack of battle-cruisers and a sufficiency of torpedo boat destroyers. Naval sand a summer of torped boat extrayers. Awar experts consider that there should be four destroyers to each battleship. Taking the effective battleship fleet of the first line at, say, twenty-five ships, we should have one hundred of these craft in the Hudson instead of the twenty-four that are in commission.

#### The New Parisian Telephone Exchange

T is now four years since the central or Gutenberg I T is now tour years same the talephone exchange at Paris was entirely destroyed by fire, and after that a temporary exchange was in-stalled while waiting for the reconstruction of the building. At present the new exchange is erected and the apparatus is commencing to be installed. The new building is a handsome one, and is built on the site of

the old one, next the central post office, but the some what narrow space due to the position of the ground is made larger by adding an overhang in reinforced concrete, so that the main halls on the different floors are no less than 210 by 36 feet. Nothing in 1ts equipment has been overlooked

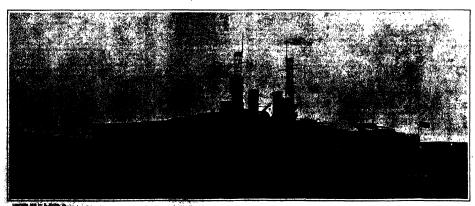
which will contribute to good hygiene and safety, and the walls are now covered with white enamel, using diffused ceiling lights and dust aspirators. On the fifth floor are the apparatus for the multiple board, which occupy each side of the long hall and are designed for 10,000 city subscribers, also the interurban boards. A second exchange board of like capacity is to be installed on the fourth floor. The present exchange serves only the central district of the town, and there are a number of other exchanges in various parts of the It is expected that the new exchange will be in full operation during the early part of next year.

#### Gale's Comet

A TELEGRAM received at Harvard from Prof. A Charles N. Wunder, director of the Leander McCormick Observatory, gives the following position of Gale's Comet as observed at the Leander McCormick

September 30.52 G.M.T. R.A. 15 hours 18 minutes. Dec. —6 degrees 36 minutes.

The comet was plainly visible in a 6 inch finder, but was invisible to the naked eye. No nucleus nor tail could be seen with the 26-inch telescope.



range of \$0,000 tons and the "Wyoming" See the first things of the navy to carry twelve 13-inch guns. Note the straight sheer and lotty recopord.

man," the most powerful ship at the Naval Review. Battleship "Ari

#### Inventions New and Interesting

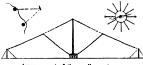
Simple Patent Law; Patent Office News; Notes on Trademarks

## A Radio-telegraphic Comp By Our Berlin Corresponden

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N OT many years ago the Prussian Departm IN Public Works commenced some interesting experiments with a view to finding a method for determining the position of ships, dirigibles, acroplance, etc., in foggy weether. At two fixed points on the Müggel Lake, near Berlin, sets of antenne were installed, each set consisting of thirty-two small poles equally spe on the circumference of a circle six hundred and fifty feet in diameter. A wireless telegraph transmitter at the center of the circle was successively connected at the center of the circle was successively connected with pairs of diametrically opposed antenne, and a different signal was given out from each. A wave-length was chosen equal to twice the diameter of the circle, so that the impulses of opposite phase would add themselves in the plane of the two antenne, producing signals of maximum intensity in that direction, while at right angles to this plane the two impulses would strike the receiver simultaneously, compensating one for the other and producing a signal of minimum in-tensity. The positions of these stations were marked on the map, and the corresponding letters of each pair of antenne, so that an airship could determine its position with respect to these two stations by noting which letters were received with a maximum in

This scheme has recently been modified to facilitate the work of the telegraphist, and reduce the tax upon his memory. To the circle of antenne as previously provided, another non-directed antenna is added. the non-directed antenna short time signals are given out periodically, and these are followed by a sucof signals from the pairs of directed antenne. These signals are identical with one another, and always be gin at a given antenna, namely, the north-south an-tennae, continuing therefrom in clockwise direction at a constant speed. A stop-watch is employed as a com-pass at the receiving station, the hand of the watch



Arrangement of the sending antenna.

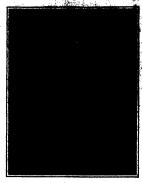
having the same angular velocity over the dial as that of the successive signals about the circle of antenne. The receiver on hearing the time signal from the non-directed antenne starts his stop-watch at the moment that the transmitter begins giving out dire signals. As soon as the signals are heard with a minimum of intensity, the receiver stops his watch and the hand then marks the direction corresponding to the minimum of intensity in the reception of signals. It takes but half a minute to complete a set of signals. Hence ten series of readings may be made in five minutes. At the transmitting station, the signals are given out by a self-acting switch. Consequently, the given out by a self-acting switch. Consequently, the transmitting apparatus requires no superintendence. The aeronaut, knowing his direction, from two fixed points, can easily find his position at the intersection of two lines drawn in the corresponding directions on the map. It has been suggested that a series of such radio-telegraphic stations be located along the German frontier at distances of not more than thirty inlies apart. Such stations would be of particular value on the north coast of Germany, to protect aeronauts against an involuntary flight over the sea. It is extimated that each station would require 1/2 kilowatt of energy which could be derived from existing power

#### An Application Long Pending

A PATENT, the application for which was pending A PATENT, the application for which was pending A long time, in fact almost equal to the record of delayed cases, is that issued on September 3d, 1912, No. 1,637,842, to Robert Creuzhauer of New York, N Y. Helen M. Creuzhauer and Cartle Creuzhauer of Brooklyn, N. Y., and Grace C Nicholo of New York, N. Y., executors of said Robert Creuzbauer, deceased.

The application was filed in the United States Patent

Office. July 7th. 1888, more than twenty-four years prior to the issue of the patent. The inventor at the time of filing his application for a patent was a resident of Brooklyn and filed the apthe application was presented without an atterney's diff in to a sa sti

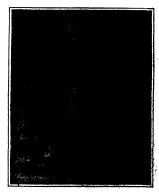


The radio-telegraphic compa

ten in the progress of the case. The case was be the Commis sioner on petition. The inventor died, and letters testamentary were filed in the application.

When the application was filed in the Patent Office. Henton J. Hall was Commissioner of Patents and Prof. Fowler was examiner in charge of the class to which the application was assigned. Both of these officials the application was assigned. Both of these officials have passed away, and Mr. Grenville Lewis, who was assistant examiner to Mr. Fowler at the time and subsequently became principal examiner in charge of the class, has also died, so that the application survived, in the Patent Office, the Commissioner, the examiner and the inventor.

The writer was told that during the progress of the case, the inventor grew old and extremely eccen-tric, and the family delayed the prosecution of the case until after his death, so that they might be able to handle the patent when issued, without obstruction or



The revolving radio-tells

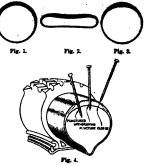
interference by him. This may or may not be true. It appears from the record that letters testamentary were granted upon the estate of Robert Cremsburer on December 6th, 1911, and the figure the application was prosecuted to its formal discounce on February 20th.

bee of annovation introducing objection

restrict still attempts to directions it without, and introducing objectionship impletions.

Many attempts have been and a specially pair year, it is professe a melitically specially still a second of the various filters, but this is at being in good the various filters, but this is at being in good the various filters, but this is the being in the processing the

This tube contains no filler, no "dope" of any kind, at is a regular pneumatic tube inflated with air is but is a regular passumatic tube inflated with air is the usual way, which, owing to some peculiar and very ingenious features in its construction, is in a large measure self-scaling, and will held the sir for a long



time, it is claimed, even after receiving a very severe puncture. The principle on which the construc-tion of this tire is based can best be explained by reference to our illustrations. The inner tube is made rather heavy at the tread and has imbedded in made rather heavy at the tread and has imbedded in it a strip of canvas seen in section in Fig. 1, which represents the appearance of the tube when first made. We now come to the important feature of the new tube. After a length of tubing has been made as usual and with the structure shown in Fig. 1 he tube is now turned inside out. An inspection of Fig. 1 will show that the survey and the first properties of the contraction of w that the canvas strip, forming as it does an arc of the inner circumference of the tube as first made, is necessarily shorter than the corresponding arc of is necessarily shorter than the corresponding are of the outer circumference of the tube. The consequence of this is that when the tube is turned inside out, the curves strip is under tension, and being inclusive, and, therefore, unable to give way to this tension, it holds the definited fire in a fair patition as shown in Fig. 2. On infiation the 'the is, of course, forced to assesse a checular freez, and the nearness strip being now elizated an the external disnumference and being, as almosty-polated out, interspiration, compresses the retiber guider-menth it; so that the tread portion of the inner tube is always under compression and therefore, self-essition:

meath it; so that the trend portion of the inner two is always unifor compression and, therefore, and conting. In point of fact a puncture under with a sharp just of point sain likely exhausted by the spiral inneresion in value. The dispursa of Fig. 4 in intended to these compliques the very in which the rether behives which the region is the point of the spiral inneresion in value. The dispursa of Fig. 4 in intended to their compliques were in which the rather behives which the position, which it deeps the first shown, it is separate position, which it deeps the first of the rether of the rather and return a tart of pulsars on the lastic of the training of the rather is reflected in its meatin. On this persons of the rather is reflected in its meating of the rether of the rether is reflected in its meating of the rether of the rether is reflected in its meating of the rether of the rether than the state of the rether is reflected in its meating of the rether of the r

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#### Methy for Inventors

An Einstein Stage Device.—In patent No. 1,088,508 Sein B. Ettspattick of New York city presents an illusion appearant identifing a minerantially vertical track or frame within which a performer our walk. ins are provided for supporting the per-ser within the track or frame and to to within the frame as he traverses the

(As. Artificial Seasage Shin.—We here imitations of various sorts or outsititutes, if you please, but Carl Hugo Hasselbiad of Jisselbian, Sweden, has patented, No. 1500,000, an artificial sausage skin consisting of a showe of fabric impregnated with a gitter substance and in the jectoristic of which the decore of fabric is impregnated with a decore of back in impregnated with a decoration of beam rind and is also stiffened by the ection of a salt of aluminium. nence Shin.---We have

of alterniatum.

A Borton to Identity Moser Vehicles in Case of Accident.—Donar A. Welsembern of Jercey City has necured patentis, Noz. 1,086,982 and 1,037,002, relating to massars for Menultying motor or other vehicles in case of accident and by within he provides for the relatest in case of accident of a number of identification cards or checks. In one patent the cards are held in a recognised, the cover of which is withdrawn in case of seedless while in the other the identification of the seed on the providential of the motor vehicles.

A Negal Cov Miller. John Herosles of the A. Mirstle Cov Miller.

A Nevel Caw Millier. —John Hungler of Indinangolis, Ind., has secured a patent, No. '1,024,454, for a new millier, which shuntines very desety the notion of the hand in millicing. The meshelins, however, the against the underside of the animal's udders and is morable up and down and laterally and has fingers arranged in separate notice for each test, with the fingers so operated, that a stacting movement of the fingers will be in succession from the appear one to the lower one, so that the mills will be gradually discharged from the test.

A Rescandar. Wheleas Detect of the contract of the stace of the contract of A Novel Cow Militer.-John Huggler of

from the teat.

A Fennenden Wirelens Patent.—A patent, No. 1.005,804, has been immed to the National Electric Signaling Company as assigns of Reginald A, Pessenden of Benatt Rook, Mass., for a wireless telegraph apparents within an inclosure of energy-absorbing material with a protecting shash nomposed of a nea-absorbing opadicuter between the energy-absorbing material and the sounductors of the appearance. In its application to an iron altip, which forms the insiderum, the leaf from the outside antenne to the indoors, material, in surrounsied by a capper shash, where it peaces through the walls of the indoors. •4

inclosure.

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STATEMENT INVESTIONS.

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Pertaining 10 Aviation.

SEASTICALLY CONNECTED SUPPACES
FOR INSULING THE STRAIGHT OF ALE
MENTAL ABROPLANES AND SUPMARINE
BEING A CHOICE OF A CHOICE
MANAGEMENT AS A CHOICE
MANAGEM

ARBOPIANE.—D. A. DAVISON, Murphy's Robbit Arms of the Control of t

#### Of Interest to Parmers.

Of Interest to Farmeses.

AFPERARUP FOR PRODUCTING GRAIN—
E. MCPARLY and A. CLIPE, Desiphan, Mo. An object here is to provide an agenratus you not be a proper of the property of the property

galanting.

GRAIN SHOCKER-P. W. Stran. E. P.

D. No. S. Osakin, Minn. This wheeler is singlecled for attackment to any grain bindes. The
bundled grain is delivered from the hinder
platform to a receiving dist, wherein the
bundles are rouged and held around a conical support until enough bundles have been
bundles are support until enough bundles have been
mechanism is automatically set in conformed
a shoot conveyer automatically graspe the as
aemblee bundles and sets them on the ground
formed in a shock.

formed in a shock.

DRINKING FORMATIN.—R. Limmar, Jackson, Tem. The object of the inventor is to provide a new and improved drinking froustain formed with improved means for dispensing the drinking freed, and associated with ment and a substaing device.

COAL DISTRIBUTOR.—R. L. Vins and C. DERMAR, P. O. BOZ 65, West Terre Hank, Idd. In this pacset the invention relates to an optimized provided the control of the control of

especially cars for transportation.

FIRIN NET RERIE.—H. A MONGO, 387 5th
St., Astoria, Ore. This invention provides a
real for sathering fish nots, skapeted to be manually or power-driven; provides a reel having
stipping devices which are arranged to yield
to a predetermined strain, to avoid breakage
of the same; and provides an outrigger conveyer section for extension beyond the guawise of the boxen or which has not is provided.

while of the boat for which the rest is provided.

Handware and Twohn.

PRUNING ENIFE.—W. SCHOMADY, care of
L. J. Le June, Denationville, Le. In this inimproved form of pruning halfs, and is particularly adapted to be used as a briar book
un the edge of a bank of a filtel, to cut and
at the same time raise the grass from the bottom of the ditter.

ACTA GERMANY TOR SCHAES—L. M.

ACTA GERMANY TORS SCHAES

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#### Household Delisies

Household Definition.

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APPARATUS NOR PURPHING WATER
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ande in the usual equipment of the bowl, and he seat may be used in the ordinary way if

featived.
ADJUNEARIE BED.—D. R. ALZER, circe of Max Leyr, takeners, Newport, Et. 1. Algolect of this feating in Newport, Et. 1. Algolect of the second o

Machines and Mechanical D Machines and Mechanical Devices.
FOLISHING MACHINE—J. F. MARON!
Wheelock St., Montpeller, Vt. This machine
is for use in treating or dressing stone, or
other material. In operation and the cubiresults of the state of the state of the state
of the state of the state of the state
other, an overhead crane heling used to bring
the stones to the unchine and leveling the
same. The bridge is then moved over the bad
and the scrale brought into contact with the

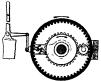


POLISHING MACHINE FOR GRANITE OR

work and started to operate. While the scrools are suggested on the bed, the crane is preparing another bed on the other side, and more over to the other bed, and so one one always being ready for the machine biffit lag of the bridge interactly while the rolleys are traveling isometrically in detection. As one traveling isometrically in detection, the companying engraving.

Prime Movers and Th Frime Movers and Their Accessories.

INTRIMITIENT GRIP DEVICE... J CAL
KIMS and F. Rick, 509 Ruron St., Port Huron,
Mich. The invention relates to a device form
lag part of a cranking or starting mechanism
for internal combustion engines, such as used
on automobiles, motor boats, aeroplanes and
on automobiles, automobiles, aeroplanes, aerop

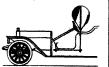


INTERMITTENT GRIP DEVICE.

wheels goared together by an intermediate goat wheel, these goar wheels being secured on a shaft, and a spring-pressed clutch mechanism connecting one of the said goar wheels with the shaft, so that when the lever is actuated the shaft and relevant to the intermediate of the control of the control of the tonal elevation of the engine stating-mechan-ism connected with an ongine shaft.

#### Pertaining to Vehicle

AIR DEFLECTOR.—H. C. DOMAY, 705 O Rt. Fresso. Cal. This inventor provides an air dedector, more especially designed for use on high speed or racing automobiles and other power-driven vahicles, and arranged to coun-terbalmon the interal or centrifugal force which is developed on the vadicle traversing



a curved course, the air defector serving to relieve the wheels or three of unders strain, and prevent silepting of the tires on the road-way. For this purpose, use is made of a vane mounted on a which shart; formande on the vabiles and under the operator's control. The seconpanying illustration shows a side sit-vation of the air defector as applied to an automobilis.

DUMPING VEHICLE.-J. JANUSATTIS, 384

26th St., Brooklyn, N. Y. The invention lates to a dumping vehicle particularly ade ed for the transportation of asphalt, a shown herewith in a side elevation, parts



DUMPING VEHICLE.

track and showing the mechanism in two parts. It provides a street truck which may be used as is sueal with trucks of this character and which may be converted into an open bottom truck for the discharge of manufacturist by a curt mounted thereon. The material from the eart, which means is disposed adjacent the driver's seat.

SHOCK ABRORREM.—N. M. ENNIL, 344 W. 18th Mt. New York, N. Y. This invention is intended more particularly as an improvement in parameter of the properties of the provided in the provided in the provided in the provided in the provided to cushion under relative movements between the traction wheels and



SHOCK ABSORBER FOR VEHICLES.

the vehicle body. The movement between the relatively movable parts is restrained during the last part of each of the long strokes yet and the last part of each of the long strokes yet and the last part of each of the last part of add strokes also of the last part of add strokes and the last part of the last pa

tion.

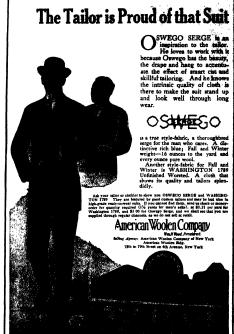
"ARRIAGE WINDOW—A M Moorx, 487
Frospect Place, Brooklyn, N Y This larention comprises a pocket into which the window sash can be inserted, and from which
withdrawn, and means for guiding the sash
is the course of its movements into and out
of the pocket. Three means engage the edges
of the sash at all times with sufficient tighttimes and the same of the same and the

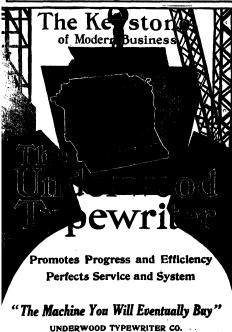
Note.—Copies of any of these patents will be furnished by the Scientific American for ton cents each. Please state the name of the patentee, title of the invention, and date of

We wish to call attention to the fact that we are in a position to render competent wervices in every branch of pation for trade mark work. Our staff is composed of mechanical, selectical and chemical experts, thoroughly trained to prepare and prosecute all patient patients between the proper states, prespective of the complex nature properties of the complex nature. The properties of the complex nature of the comp

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Patent Attorneys, 361 Broadway, New York, N. Y. Branch Office . 825 F Street, N. W., Washington, D. C.





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#### Duplicating Machines

(Concluded from page 40%)

Events began to move move rightly, with the result that what fine-bed dualcators appeared upon the markes—other spinner duplinators appeared, and in the turn claiming to be a further approvement and development over the former models.

Duplicating machines are now on the marker with address pietes, which can be inserted in the machine so that each letter duplicated is addressed at the same operation. The advantage of a machine of this character like in the fath that the inked impression of the address and the reproduced letter are identical, as both are printed from the same ribbon.

Then followed the direct inking device, attached to a duplicating mechine and the automatic feed, so that to-day a depictering machine becomes an office printer, as the operator simply places in the machine as electrotype plats, together with a quantity of paper, turns on the current and the machine does its own feeding, printing and electing.

To go a step further, another firm brings not a machine that is a duplicating machine and addressing machine in one. If, too, is automatic, and after the form is set-up the operator takes the addressing machine list, places the addressing piates in the magazine, equips the outfe with a supply of peaper, turns on the current, with the result that the name, address, and salutation are automatically changed upon seech letter. In other words, the letter is ready for final mailing.

More recently, one of the duplicating devices has been equipped with a signature device so that when the letter is duplicated the signature is automatically placed upon the bottom of the letter, and the imitation is so excellent that it is accepted by many as a true signature.

While the office dupletating smachine for dupletating letters in quantities was being developed to a high ploint of perfection the machine for producing shop-specific producing the producing shop-specific producing

Very recently there has been produced a remarkable photographic device which delivers within a few minutes a duplicate of a design or drawing—photographically reproduces a piece of machinery or a sample carroon, or supplies a photograph of a new lace curtain design. In fact, this new photographic device can be used in a thousand different ways in the conduct of business, and for this device there is already a very large field prepared to adopt the outflit as rapidly as it is known that such a machine is available.

#### Signing Ten Times at Once.

Another wonderful duplicating device is the signature machine, which enables the user to sign his name ten or twenty times in one operation.

Through the use of a master pen all pens attached to the device are controlled and bonds, checks, and certificates are sized with great rapidity.

signed with great rapidity.

With all the wonderful duplicating devices and systems of all kinds and characters, the largest duplicating field of all remains unstoned. A fortune awate the inventor who will give his thought and attention to the simplest field which is the biggest field of all. There is to-day a world-wide demand for a simple device, not too cumbersome or expensive to its stall and not too expensive to maintain, which will enable each business house for

# PSTIFF VI

All communications are streigh; conditionated.
Our vast practice, extending over a particul of more than sixty peans, analyse up in many same to advise in regarding agreement by the many same common to the closes. Our final fisch on Francis is over free or request. The application of the contribution of t

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3—It is round—4 inches in diameter—Permits the rotary motion so necessary to proper sharpening More equare inches of sharpening surface than any other stone.

There is a carborundum sharpening one for every sharpening requirement. You'll find them in hardware stores

or expensive to larcentre to medicate and the CARBORUNDUM COMPANY is department from the Carborundum Company



# There is **Profit in Fire** Protection

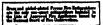
To remove the dread of fire is just as important as to install the very latest laborsaving devices in your plant.

The improvement of working conditions means the improvement of work.

At every danger point in your plant, place Pyrene Fire Extinguishers-the most efficient known. Then having removed the dread of fire, watch for the

improvement of work and the increased production.

Pyrene employs a new principle in fire fighting. It smothers with a heavy noninjurious gas-blanket and does not wet down or stamp out by mechanical



are from one to six copies of its sta-

distribution one to six copies of its sta-distribution reports, seies records, departments charts, balance sheets, etc.

There is a demand for a device or sys-tem which will secure a true reproductean which will secure a true reproduc-tion of certain correspondence, some of which is accompanied by intricate orders or aksiches, the original of which must resistant in the office. At the present time it is necessary to make a duplicate by hand so that quotations upon certain work can be secured through other depart-ments. If a simple and inexpensive device can be secured thousands of dollars can be saved, as with one or two copies of a letter made at a moment's notice, in-valuable time could be saved.

If, at the present time, an important ster is received which two officials must see immediately, one must now wait upon the other, while in some cases there is nothing to do but make copies of the letter or papers so that two or three officials can each have their working copy.

Street railways make up large reports weekly. These reports have been added to day by day with a pen, and when com-pleted from four to six copies are needed, but at the present time there is no meth od except to take carbon copies of these sheets, which are nothing but a mass of figures in columns and ruled boxes.

Inventors have apparently been looking at the duplicating proposition from the outside of the office, and have given Mittle attention to the largest field of all, nor have they appreciated the opportunity which is waiting for the man who will give the business world the duplicating device which they need most of all.

#### How One County Built a Good Road (Concluded from page \$98

hint that an entirely new and shorter read between important points might be opened, and that it would very likely run through his property. Well, it was the disagreeable task of the commission to undeceive nine tenths of the farmers in molecure nine tenths of the intribers in the district. It was to be expected that some of the hearings before the commis-sion would be a triffe stremous, and the members were not disaprointed. However, at length it was decided to

pave with brick the road leading from Chester, the largest town in the district, toward Hookstown, as far as the Penn-sylvania State line, a distance of three and one half miles. The road leading from Chester to Fairview, a town in another district in the same county, is to be paved for two and one half miles remaining money is to be expended upon paving one road leading from Newell and one from Arroyo, the only other towns in the district.

Surveyors and engineers were th ployed and grades established, for the most part along the lines of the old roads, though occasionally to secure a road not quite so precipitous slight deviations quite so precipious signt evitations were made from the old highway. In one place where a road followed the bed of a small creek for a short distance in a narrow valley, it was necessary to cut

an entirely new road in the hillside.

It was decided that the foundation should be of broken stone seven inches thick, covered with three inches of gravel and two inches of sand. On this foundation bricks four inches thick are to be laid. The pavement itself will be nipe feet wide with concrete curbs on each side. A dirt driveway will parallel the

pavement. Wherever practicable it will be of the same width as the pavement. While the cost of grading is heavy, stone for the foundation costs practically nothing, for in most places it can be due from ledges along the road. Gravel and sand can be procured at small cost from and can be procured at small cost from the Ohlo River. The paving brick are manufactured in the country scarcely ten miles from where the reads are being built and can be shipped to the district at small cost for freight. The contract for grading, paving and countries was let by competitive bidding affect the specifi-cations had been well affectived in the local, papers. At man, from smallers feats, flows that selected the scarcing of the forms of the secrept the scarcing.



#### Franklin "Little Six" Thirty

A full powered, efficient car of light weight, operated at low cost.

Silent, smooth running and flexible—the only six-cylinder "Thirty".

Built in two types-a five-passenger touring and a twopassenger Victoria-Phaeton. Price \$2,800.

Men accustomed to studying and analyzing the technical reasons for unusual mechanical results will be interested in knowing why Franklin motor cars (1) use less gaoline, averaging 20% to 35% more mileage per gallon; (2) use less oil, averaging 400 miles per gallon, without smoke; (3) use fewer tires, averaging 9,000 to 10,000 miles per set, the 1911 record; (4) travel faster in the long run, owners thinking lattle of making 250, 300 or even 350 miles and more per day, without fattgue; (5) ride easier, bowling along so smoothly and comfortably, wethout job or air that disease and occurrent was repossible that the tangue; (3) not easier, bowing atong so smoothly and committed, without joil tor jar, that driver and occupants are unconscious that they are steadily traveling 30, 35, and 40 miles per hour; (6) and wear longer than other care, depreciation being much less, due to the intelligent, scientific use of carefully selected materials.

There are sound technical reasons for each of these facts. They are clearly defined in an interesting, concise style, in a booklet, entitled "An Analysis of Franklin Motor Car Construction", recently issued by our



A copy will gladly be mailed on request to any one seriously thinking of buying a car. Of course, requesting this booklet does not obligate you in any way, nor entail listening to the all-too-common, follow-up solicitation, but we would appre-ciate your writing on your business stationery and signing your official lite. Kindly address Department S.

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When you dictate now, you must wait for your stenographer to come with book and pencil You must adjust the speed of your speech to her ability to take it down Often you must wait for her to catch up. Your whole day's work is measured, not by your capacity, but by the capacity of your stenographer.

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and put an end to wasting to the long hours of getting ready Your typist begins work at her desk practically as soon as you do at yours. Your first letter dictated she starts transcribing it and from then on all day no matter what you are doing she is busy. She turns out twice as many letters because she is at her machine twice as long. She does them faster and better because she does not need to strain her eyes looking back and forth from her book. She does not stop to decipher illegible notes. She simply copier fast and easily what you have talked into the Dictaphone—what the Dictaphone talks to her

You can dictate any time—get the idea out of your system while it is hot with enthusiasm—and you don't have to stumble along at eighty words a minute. There is no speed limit to the Dictaphone. You can talk fast, naturally, energetically, two hundred words a minute if you wish—just as you would if the man you wrote to sat beside your desk. Result not lifeless formalities but red-blooded letters that get results

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a CRAME SHAPER of which the measurables objet. This moidles was dealthed in year paint and filler, not us believe it is well dealthed a piece of work as one namely found in the simplicity and trape."

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how to be only commendation for the pro-motive of the improvement. Following the special election of Sovember, 1811, when the road bonds were authorised, a sentiment of pride in the improvement seathment of pride in the improvement rapidly aways over the district. It is almost impossible now to find a man who will acknowledge that he voted against the good roads project. During the cam-pating preceding the least require lec-tion to fill county and district offices, nearly every candidate claimed loudly the honor of having been the originator of the plan to pave the roads.

The heavy rains of the last month have The newly rains of the last mouth have retarded greatly the work on the improve-ment of the roads by washing out the sand and gravel spread in place read-for the laying of bricks. The loss, which amounts to several thousands of dollars, will have to be borne by the contractor Had the weather been dry during the last month several miles of pavement would have been in place by this time.

#### The International Congress on Hygiene

THE Fifteenth International Congress on Hygiene and Demography, which closed its sessions at Washington, D. C. on the 28th of last month, was the first to assemble on United States soil, and is generally admitted to have been, in some respects at least, the most important held so far in the history of the institution. In no other meeting of the congress have been communications so promising for the future of hygiene, while several of the discoveries brought to the attention of the delegates are in themselves notable advances in biological and medical advances in biological and medical science. Among these is the discovery by Dr. Frederick Novy, of the Univer-sity of Michigan, of a micro-organism which may prove of value in checking the bubonic plague. Next, if not equal, in importance are the discoveries that typhus germs are carried upon the bodies of certain parasitic insects, and that the germs of measles may be disseminated

germs or measures may be desseminated not only by desquamation, as has been believed, but also by sneesing.

The gathering, presided over by Dr. Henry P. Walcott, of Massachusetts, included representatives from every civilised nation, numbering about 3,000, prob-ably the most noteworthy scientific asembly ever seen in the national capital,

#### orts and Rooks as Disease Carriers.

It was on this first day of the congress hat Dr. Frederick G. Novy announced his discovery of a micro-organism which he regards as possibly of high value in dealing with the bubonic plague. It is desing win the bushine pages. It is peculiarly fatal to rats, the generally acknowledged carriers of the bubonic plague, and plainly suggests a means of exterminating these rodents. Drs. John F. Anderson and Joseph Goldberger, of the United States Public Health Service, announced, among other discoveries made in the course of experiments on monkeys, that they had traced typhus fever to an insect—the louse—as a carrier, and that their investigations along this line had disclosed nearly 300 cases of the discass disclosed nearly 300 cases of the discass in New York city, as well as many others in Chicago, Phindelphia, Battimore, and Washington, although it was thought that typhus had not visited America for some

years.

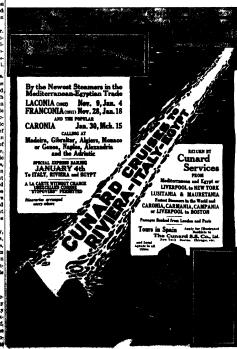
In the section of hypicatic microbiology,
William R. Rebneck, of Philadelphia,
speaking of books as disease curriers,
said that analysis of dust taken from
books lying ustombed for forty years in
Florida, showed that it contained diphtheria, tryhna, blacking, and taberculesis
health.

#### Water and Fond Supply.

Water and Free Supply.

An interesting photosphory was the se-qual of a paper and an the second day by Prof. Rawin O. Seissian, or the University of Chicago, on the Rawinston of Britain ing Water. The Singhams and by Prof. Johann again the supplementation of the formation of the Santana and the Santana Santana and Santana and Santana.







Storage



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The demand for speed and power, for sustained voltage depend-bility and general high efficiency, has led to the selection of the Bonny and general mign embertory, has no an absolute that the U.S.L Storage Battery for every important installation of electrically-driven fire equipment in the United States.

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batteries. Endorsing their service, Chief Engineer W. H. Daggett says: "The apparatus has not been an hour out of service on account says. The apparatus has been succeeded and after two years of service the plates show scarcely any sign of deterioration. I can say that our experience with U-S-L Batteries has thus far been very pleasing er satisfactory." and altogeth

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A book of photographs by E. Muller, Jr., Official Photographs of the Unit with an introduction by the Homenthic George Von L. Meyer, Secretary of taining recent photographs of all the United States Dreadmoughts, Bettles Crultern, etc., showing thips in action, battle practice, torpedo practice, etc. er, Secretary of the Navy, con-inoughts, Battleships, Armered do practice, etc.

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University of Jena, who maintained the New Labor Survey superior effectiveness of smittary surveys To this criticism Prof. Jordan poplied admitting the importance of the sautiery urvey so far as it went, but denying survey so far as it went, but denying, its sufficiency apart from henoretelepted szamination. Dr. Gasziner also look is see with Dr. A. C. Houston, director of the Metropolitan Water Board of London, on the Purification of Water by Storage, and quastioned the claims of certain Franch extentions to the purifying power of the attention trained water.

of the ultra-violet rays.

In his address on "The Nutriment of the People," Prof. Max Rubner, speaking from his experience of German distotic habits, said that the increased cost of living and social ambition were both tell ing upon the population of his own coun try. He said:

try. He said:

"One of the greatest, if not the greatest, of problems now confronting maintind is that of perviding the race with proper nourishment. It is of such importance, in fact, that every large city should have a department in its government clothed with plants of the such in the government works. Changed conditions in the lest half owntury have brought the question of feeding the human race to a critical point. The growth of the cities and of the industrial worksers as a class has complicated the problem the city governments to maintain a justice whether the city governments to maintain a justice whether the city government is maintain a justice whether the proper nourishment."

After urging that ill-nourished children should be fed by the public school authori-ties, Dr. Rubner continued:

"There has been a distinct step backward in the organism of the workingman. This la due to two causes: First, insufficient, nourishment, and, second, the fact that the new are of machinery has specialized and confined his physical exertions so that he gets little or no natural carectias."

#### Hygiene of the Very Young.

A paper by Augustin Ray, a distin guished French architect, read by Mr. Adolphe Smith, of the London Lancet, before the section of school hygiene, in sisted upon the importance of ultra-violet rays to human health. We cannot demand too forcibly, Mr. Ray thinks, that ultra let light shall be largely admitt dwellings as a factor of microbian purifi cation. In killing the microbes, we inci-dentally preserve the eyesight of the chiliren, and for this purpose the windows of school buildings should be specially conso the windows of structed: "No classroom is satisfactors that is not well disinfected by the direct rays of the sun." Private speculation in land, therefore, should, in the opinion of Mr. Bay, be checked.

Dr. C. Ward Crampton, director of Physical Training in the New York Public Schools, advanced the theory that by their physiological development than by age, in order that appropriate treat ment may be applied to the mature and ment may be applied to the mature and the immature. Dr. Caroline Hedger, of Chicago, presented a strong plea in her address on "The School Children of the Stock Yards District."

#### Industrial Dangers.

Henry Japp, of the American Society of Civil Engineers, plausibly advocated the adoption of the medical air-lock in all caisson workings, asserting that when it was first introduced it brought down the "death rate from caisson disease from 25 per cent to 1 per cent, and in the latest of the large engineering enterprises the death rate has been reduced still further, to nineteen one-hundredths of 1 per cent."

Mr. T. Kennard Thomson, treating the same subject, maintained that many or of the disease are due to foul air rather than to compressed air, and he cited in support of this view instances which oc-Avenue Bridge, New York city.

Avenue Bridge, New York city,
An apparent difference of views developed upon the paper on "Injuries Canaed
by Electricity," which was presented by
Sir Thomas Oliver. This paper included
the following directions for first aid to
persons suffering from electric shock:

"The first thing a rescuer her to do in to were the contact by cutting the wire, called sing taken to protect the hands by day contact the greatest care stant be estimated. In the



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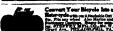
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moving the body from the live metal, and especially if the workmain clothes are damp. India rubber gloves are the best protective. When the body has been removed from contact it should be placed upon its back medical assistance sent for, and artificial respiration should at once be started and continued for a long time.

Dr. J D. McGowan, surgeon of the Commonwealth Edison Company of Chi engo, was inclined to a more optimistic view of the accidental dangers of the electric current than had been taken by Sir Thomas at the opening of his paper Dr. McGowan declared that, among hun-dreds of cases of shock within his observation, where immediate death had not taken place, the patient never suffered except from the local effect of the burns The impression that such shocks cause paralysis and brain lesions, where they do not instantly kill, is, he as

#### Human Vehicles of Disease.

Wednesday, the third day of the congress, brought with it discussions of unusually wide interest Among them were those which followed the papers on infectious diseases, rend by Drs. J. C. Led-ingham, of the Lister Institute, London, and William Lorenze Moss, of the Johns Hopkins University. The case of "Ty-phold Mary," it appeared, had attracted phold Mary, it appeared, has accracted much professional attention on the other side of the Atlantic; but it was not unique. Dr Charles Boldman, of the New York city Department of Health, said

"Typhold bacilius carriers have a very large slage in producting typhold infections in New York city. In particular, great importance for the production of the production of the rice employed in dairying the such carrier studied by me caused over 800 cases of typhold fever in New York. It is now agreed that no known typhold carriers should be allowed to engage in dairying. The great difficulty at carriers, and this, like many other public health problems, is largely a question of ex-prene."

Dr. Fornet, of Berlin, argued that the ampaign against typhoid begun in Ger many eight years ago has shown that the disease sticks to the place where it has once occurred. He added:

has once occurred. He added:
"The fact that I could trace thirt-one
families where two or even more members
were typhod-basts makes it likely that a seoad Infection with typhoid hacilli often makes
people become healiff carriers. A theory, I could
verify by caperiments on beasts. Cleanlines
alone can do much in preventing this undestrable state of the body."

Dr A C. Abbott, of Philadelphia, said that in his city the authorities, having examined every child in a certain school situated in a district of 15,000 inhabitants. studied in a district of 13,000 innantants, found thirty bacillus carriers among the pupils, sent them home, and in this way put an end to an epidemic of diphtheria which had already made some headway.

#### The Brass Founder's Perils.

Statistics gathered by the Illinois Commission on Occupational Diseases show that in 1910 only 17 out of 1,761 brasfounders in Chicago were over 50 years of age, while less than 15 per cent were over 40. Investigations made in England a rew years ago developed the fact that only 10 brass founders out of 1,200 were Pruden System investigations made in England a over 60 years of age Dr. Emery R. Hay hurst, after speaking of the more general sanitary conditions of this occupation, discussed more particularly the disease known as "brass founders' ague," which

a German investigator, Lehmann, has traced to the inhalation of zinc fumes Dr. Havburst in maintaining the thousa that these specific occupational maladies are preventable, said that the workers t not breathe an atmosphere laden with gine or other metallic fumes. Brass with sine of other meters the spacetors, well-ventilated foundries or smelters. Higher ceilings, more partitions, better eating and sanitary quarters, better natural ventilation, and artificial ventilation for the pouring hours, especially in win-ter time, are all that are required. There are no autidotes for brass founders' ague. The workmen's remedy, whisky, is worse than useless; all is prevention."

Two topics of sensational interest to

the general public treated on this day were the victorious war carried on by the United States authorities in Porto Rico

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cheap saw, and no one else should.

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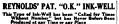
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gainst the hookworm, and the appalling statistics of infant mortality. The for mer was the subject of an address by Dr. Bailey K. Ashford, U. S. A.; in speaking of the latter, Edward Bunnell Pheips, edi of the latter. Edward Bunnell Phelps, edi-tor of the American Underversive, told the section on demography that the world's infant mortality probably reaches the enormous figure of 40,000 bables deaths each day, year in and year out, while in the United States the number probably reaches 1,000 a day. Mr. Phelps held that the world's infant mortality can very well be reduced 50 per cent.

Mental Hygiene and Criminology. On the fourth day of the congress, Dr Woods Hutchinson, of New York, address ing the section of mental hygiene, claimed to have information that the principals in the famous Los Angeles bomb outrage in the ramous Los Angeles bomb outrage were victims of hereditary taint. Con-tinuing along this line of argument, the speaker recommended that all children ascertained to be mentally defective should be segregated from the schools. Dr. L. F. Barker, of Johns Hopkins Uni versity, president of the section, and also president of the National Committee on Mental Hygiene. Dr. Barker explained the meaning of the National Committee's campaign as "a systematic attempt to se cure human brains so naturally endowed and matured that people will think, feel, and act better than they do now."

In his paper on "The Problem of Drunk-

enness." Dr. Irwin H. Heff, of Mass setts, dwelt upon the futility of publitive measures. He also insisted that control by State or municipal authorities is necessary to efficiency in the treatment of confirmed drunkenness, and laid down as fundamental in such treatment the following two principles:

"1. A comparatively small percentage of ers of alcohol are confirmed drunkards or

users of sloybol are confirmed drussards or instruitates.

"2. The appropriate care of the alcoholic implies both curative treatment and custo implies that the state of the case which is likely to be benefited. The custodial, for economic reasons, about the case of the reddivist constantly appearing in the courts. Buth a differentiation must wentially be made and appropriate segregation of those two types established."

#### Hygiene of the American Farm.

On the fourth day also the State Health Commissioner of Indiana, Dr. J. H. Hurty, exhibited the sanitary conditions of American farms in a light very surprising to those who have held the conventional opinions of rural well-being. Said

Dr. Hurry.

"Most farm houses are unaunitary. In
them the farmers and their families experience frequent libeases and early death. The
natural duration of life is realized by only
one half on the farm. It is associately no
note the foreignery of the intimate relations
of the farm well and the cesspool. The farmer seems determined to locate his cesspool
so that its contents will facet the well."

Farm-house cooking, he maintained, is done in dirty kitchens, with the assist-ance of flies and cats, while the ventilation, in winter at least, is all that it should not be.

#### Nathan Straus on Milk.

At the Friday sessions Mr. Nathan Straus, the founder of the New York milk lepots, spoke on the subject with which his name is so honorably associated:

his name is no honorably associated:
"It is the duty of the public authorities to see that the milk applies are pure and where-some, but it was because the monitchal authorities were not alive to their opportunity are not alive to their opportunity of for voluntary organizations, and it is because individuals and associations took up this work of protecting regulations, and it is because it length come a great awakening, and we now have boards of health in hundred of cities have beards of health in hundred of the bet-terment of the milk supplies."

During the summer of 1912, Mr. Straus said, there was but one death among the 22,000 bables supplied from the Straus aboratories; and this one fatality was due to pneumonia.

Anaphylaxis to Infectious Discu A brilliant prospect of victory over ty-phoid and tuberculosis was revealed in the paper read by Dr. Victor C. Vanchen, of the University of Michigan. Of the



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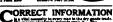
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phoid Dr. Vaughan pointed out that the period of incubation lasted about ten days. Then comes the period when "the et of the disease manifests itse onset of the disease manifests itself. This marks the time when the body cells have been sensitized, beginning to elaborate in active form a secretion which splits up and destroys the typhoid bacilli continues during the course of the disc In splitting up the invading organism the protein poison is set free, and this is accountable for the symptoms and lesions of the disease. If the poison is set free too rapidly the temperature fulls and death results. This is practically what occurs in every infectious disease, whether it be of bacterial or protozonl origin." Dr. Vaughan went on to adumbrate a process by which the cells of the body can be trained to grapple success-fully with this poison. If his conclusions are verified in practice, a means will have been found to resist typhoid and other been found to result typnout and countries infectious diseases, just as effectually as we now resist smallpox. "At the cost of untold sickness and numberless deaths." he said, "the white man is becoming immune to inherentosis, but this increasing resistance may be strengthened by the general use of vaccine. A perfectly harmgeneral use of vaccine. A perfect harm-less and efficient vaccine can be obtained. Not only will this prevent tuberculosis and other diseases, but it will cure them."

#### Final Sessions.

The final day of the fifteenth congress was marked by the passage of resolutions, among which was one approving a proposal for an international committee to promote a uniform classification of colon bacilli. The most important recommen-dations were: An international agreement to secure uniformity in the reporting of occupational diseases; greater uniformity in medical department reports of the navies of the world as to causes of divorces, and that such reports, when made, shall conform to a uniform standard, and be periodically published; a c mission to secure uniformity in criminological statistics; lastly, that the per nanent International Committee be infor future congresses, such bureau to Le established in the near future, with headquarters at The Hague.
No definite arrangement was made as

to the place of meeting of the next con-gress (1915) A strong tendency was manifested to accept the only invitation A. C. thus far extended, that of the Brazilian government; but the general feeling eventually proved to be opposed to two esive gatherings in the New and Russia would have been decided on and Russia would have been uscause on as the next rendezvous, but that the invi-tation of the Czur's government had not reached Washington when the congress adiourned.

#### Daniel Webster on Patent Property

Daniel Wenter on ratem rroperty

UR attention has been called by George
Ber, to the able segment of Daniel Webster in the suit brought by Charles Goodyear vs. Horse H. Day in the U. S. Cirsuit Court, District of New Jersey, for the
infringement of Coodywar's patents of 1859
and 1869 for Improvements in the Vulcanization of Rubber.

Mr. Webster appeared as counsel on behalf of the complainant and the extract from his argument which is here repr duced shows that this learned statesman as far back as 1852 had the right concept of the protection to patent property rights which the framers of the Constitution intended to secure to inventors. As pointed out by Mr. Webster, it was not pointed out by Mr. Welster, it was not the intention of the framers of the Consti-tution to grant monopolies, that is, to re-strict and confine to a few, rights which had theretofore belonged to all, nor to actually grant property rights, but the intention was to secure for a limited time the exclu-ive right of property in something that had sever actised until the inventor produced is, and which but for ids efforts while perhaps never have been knowns.

Mr. Welster, it seems to us, has clearly





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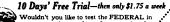
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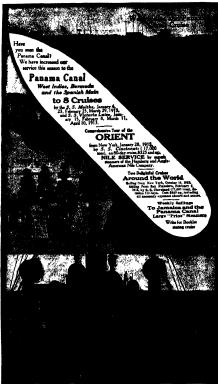
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and lucidly pointed out why patent property should be afforded equal protestion with other kinds of property and the equities for such protection. A man who clears a part of the wilderness and produces a fertile farm in time acquires title thereto which the courts will protect forever, and progress of civilization, he certainly has done no more than the inventor to advance the progress of civilization. Surely the inventor is also entitled to that pro-tection which the framers of the Constitution intended he should have for the limited period which Congress has fixed as the term of a patent. Mr. Webster said:

"It is provided in the Constitution of the United States, that Congress shall have power to promote the progress of science and the useful arts by securing for a lim-ited time, to authors and inventors, the lited time, to authors and inventors, the seculative right to their respective writings and discoveries. The law acknowledges the existence of the right of an inventor to his invention as property, and the Consti-tution is remarkably exact in the language in which it speaks of this important sub-ject. The Constitution does not attempt to give an inventor a right to his invention, or to an author a right to his literary productions. No such thing. But the Constitution recognizes an original, pre-existing, inherent right of property in the invention, and authorizes Congress to secure to inventors the enjoyment of that right. But the right existed before the Constitution and above the Constitution, and is, as a natural right, more clear than that which a natural right, more clear than that which a man can assert in almost any other kind of property. What a man carns by thought, study and care, is as much his own as what he obtains by his hands. It is said that, by the natural law, the son has no right to inherit the estate of his father— or to take it by devise. But the natural or to take it by devise. But the natural law gives man a right to his own sequisi-tions, as in the case of securing a quad-ruped, a bird, or a fish by his skill, industry or perseverance. Invention, as a right of property, stands higher than inheritance or devise, because it is personal sarning It is more like acquisitions by the origina right of nature. In all these there is an effort of mind as well as muscular strength. "Upon acknowledged principles, rights

acquired by invention stand on plainer principles of natural law than most other rights of property. Blackstone, and every other able writer on public law, thus re gards this natural right and asserts man's title to his own invention or earnings.

'The right of an inventor to his invention is no monopoly. It is no monopoly in any other sense than as a man's own house is a monopoly. A monopoly, as it was under-stood in the ancient law, was a grant of the right to buy, sell, or carry on some particu lar trade, conferred on one of the king's subjects to the exclusion of all the rest Such a monopoly is unjust. But a ma right to his own invention is a very diff ent matter. It is no more a monopoly for sess that, than to possess his own homestead.

"But there is one remarkable difference in the two cases, which is this, that property in a man's own invention presents the exclusive enjoyment of his own. For by law the permission so to enjoy the inven-tion for a certain number of years is granted, on the condition that, at the ex-piration of the patent, the invention shall belong to the public. Not so with houses; with lands; nothing is paid for them xeept the usual amount of taxation: but for the right to use his own, which the natural law gives him, the inventor, as we have just seen, pays an enormous price Yet there is a clamor out of doors, calculated to debauch the public mind.

"But a better feeling begins to prevail, nore intelligent estimate of this species more intelligent estimate of this species of property begins to spring up. Yet I am sorry to say, that there have been men, there still are some men in the community, who would not do an immoral action, who would not for their lives 'pick a flaw' in their neighbor's title-deed, and who yet makes no scruple of endeavoring by every means in their power to 'pick a flaw' in his patent. That feeling is unjust, illegal, and unacodal."



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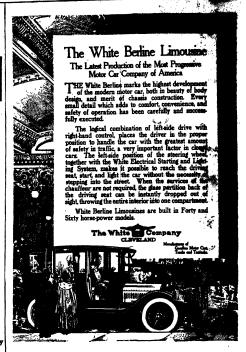
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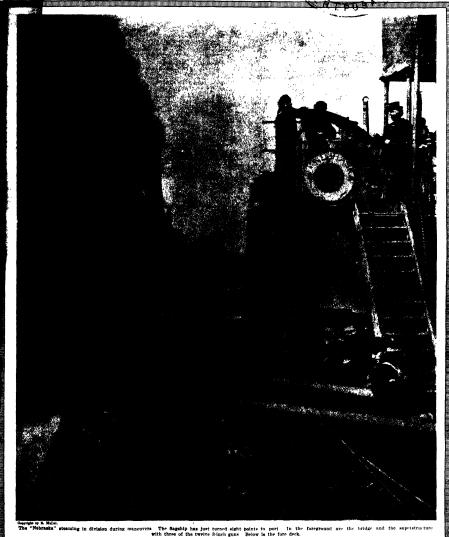


# CIENTIFICA MERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, OCTOBER 19, 1912

10 CENTS A COPY



OUR FIRST LINE OF DEFENSE-A BATTLESHIP DIVISION IN MANEUVERS.-[See page 328.]

## SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, OCTOBER 19, 1912

d by Munn & Co., Incorporated. (Charles Allen Munn, Pres Frederick Converse Beach, Socretary and Treasurer: all at 361 Broadway, New York

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## Munn & Co., Inc., 361 Broadway, New York

The follows always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are only the articles when and the facts embladie the contributions will receive special attention. Accepted articles will be paid for at require space rates.

The purpose of this jou nal is to record accurately, simply, and interestingly, the world's progress in scuntific knowledge and industrial achievement

## Patent "Evils"

HREE so-called "evils" have been made the tempts to restrict the enjoyment of those exclurights which the inventor of a useful article of

muchine now endow under the Constitution

First of all there is the "evil" of fixing the price at which a patented article is to be resold to the public Patent law reformers apparently fall to realize that no one is compelled to buy a patented article. If you object to paying \$5 for a safety razor, you are at perfect liberty to use the old-fashioned naked blade You are not deprived of anything that you enjoyed before. Surely there is here a fundamental difference between the monopoly which controls a necessity of life and fixes the price at which it may be sold, and surely the framers of the Constitution were right when they endeavored to encourage inventions by granting for a limited period a monopoly which often meant increased riches for the country

The same argument applies to the "evlis" supposed to arise when the vendor of a patented article pro-hibits its use, except in connection with other unput ented articles purchased from him. The history of one invention of which we know sheds much light on the practice. That invention is a duplicating machine which is now to be found in almost every well-equipped business office. The first attempts to introduce it were discouraging. It was offered to bank presidents and merchants at a price which represented but a small increase over its cost of manufacture—in other words a reasonable profit. Despite the merits of the machine, office managers would have none of it Then it was that the patentee hit upon the idea of selling his chine at a little less than cost, with the understandting that he was to supply the stationery, the luks, and the supplies necessary to make duplicates by the ma-chine. The effect was magical. Every one wanted chine The effect was magical. Every one wanted to use the machine at the new low price. No one seemed to care that the manufacturer was deriving secure to care and the manufacturer was deriving a far greater revenue from the profit on supplies, how ever tensonable that profit was than he would possibly have earned had be succeeded in selling his machine at the ortificial price and left to the purchaser the privilege of baving supplies wherever he could. Here we have an instance in which business strategy of a bigh order was required in order to introduce an invention which measurably increased the amount of business that could be handled with a small office

The third 'evil" of which we fear much, is that suppressing patents or prohibiting their use in order to prevent competition with other patented or unpat-ented articles sold by the owners of the patents. Not a single lustance has come to our notice of wilful suppression. The telephone company, the manufacsuppression (a corpliance company, the manufac-turers of type-setting and type-casting matchinery, mak-ers of typewriters and machine tools have taken out hundreds of patents which are not "worked". But in-every one of these cases it will be found that the inventions have been developed by the companies them. selves. Often as many as ten or even fifteen patents are taken out on as many machines for accomplishing but one result. Of these patents perhaps only one wil

"worked." for the simple reason that the machine which it covers is the simplest and most efficient. Despite the fact that the unused patents represent an investment of perhaps \$150,000 (not an unusual figure) in discarded inventions Mr. Oldfield would compel the owners of the patents to grant to any one the right to use them-in other words, grant a license which would create a rival who has himself contributed abso-lutely nothing to the art. Again, it seems to be overooked that at the end of seventeen years, a patented stention becomes public property; anyone has the invention becomes public property; anyone right to use or sell it. Even assuming that inventors or their assignees did suppress patents, what injury has the public sustained? It has been deprived of nothing: it has the right to use the invention after the

logal monopoly has expired

After all, Mr Frederick P Fish, one of our most
eminent pattent lawyers, and Mr Louis D. Brandels,
both broad-minded men, both realizing the necessity of reforming our patent system so that an inventor and the public will be more fully protected, were cor-rect in their views "The right to accumulate patents," rect in their views "The right to accumulate patents," as Mr Fish remarked, "is one thing, the right of a number of manufacturers who own patents to come together and consolidate is another thing." That important distinction seems to have been overlooked, "To meet this situation wherever or whenever it may exist," said Mi. Brandels, "what is needed is not a law dealing specifically and in this limited way with patents, but dealing broadly with the situation; which is going to cover not only patents, but is going to cover nil articles."

#### The Lesson of the Naval Review

HEN the President of the United States, amid the thunder of section. down the flar-flung line of warships at the recent Naval Review at New York, the sight was one which might well bring a thrill of patriotic pride to the hearts of the assembled multitude. Twenty-five years ago, when our new may had its modest begin-nings, scarcely a ship of the vast fleet which has just disbanded was in existence. That we have so power ful a many to-day is due to the generosity of Congress, especially in the earlier half of the period referred to. That our Navy is so strong in battleships is due the foresight of our Navy Department in putting the bulk of the displacement of its ships into capital ves-sels, able to take their place in the first line of battle. To-day the United States barely holds its proper posi-tion of second in naval strength among the navies of the world, if indeed we have not lost that position to the world, if indeed we have not lost that position to Germany Battleships are essentially the guardians of the peace, particularly when they do police duty for a mitton so rich in resources as our own Just now, when the growth of the country in wealth and influence is so rapid, there should be a proportionate inin the number and power of our fighting ships of the first class. The unfortunate action of Congress during the past year has shown how little this fact is realized. The battleship appropriation was cut in half, and when vessels have reached a displacement of 20,000 to 30,000 tons, the cutting down of the programme by one ship represents an enormous loss of fighting If our Navy is to maintain its proper stand ing, not only will the annual programme of two battleships a year be strictly adhered to, but Congress next year will make good the deficit of this year by an appropriation sufficient to cover the construction of three battleships of the greatest size and power

The following considerations will show how great is the deficit due to the elimination of one ship. This vessel would in all probability have been an enlarged "Nevada." of 30,000 tons displacement, mounting "Nevada," of 30,000 tons displacement, mounting twelve of the new powerful 14-inch guns, behind armor forty per cent heavier than any carried by the modern ships at the review. Because of her powerful guns, remarkable protection and superior speed, this ship would be more than a match for three ships of the "Connecticut" class, at the great range at which she would elect to fight them

#### Seattle and Puget Sound Harbor Improvements

N the year 1908, when the Atlantic fleet of sixteer battleships steamed into Puget Sound and dropped latticeships steamed into Puzet Sound and dropped anchor in crossent formation a short distance from the sheeks at Seattle, striking evidence was afforded as to the ampie depth of water and wide area of an-chorings afforded by the harbor. A latticeship fully loaded often exceeds a 30-foot draft. An even finer demonstration was afforded when on September 18th last the steamship "Minneouta.", the largest cargo car-tier on the Pacific, drawing 30 feet of believe fart, under her own steam, backed out from her pier, swung into the harbor, and without the assistance of two was the harbor, and without the assistance of tugs, was soon under full headway for Yokohama, carrying what was probably the largest cargo ever carried by any

se excellent natural advanta: tered waters, are to be suppl costly improvements—the work part States Government and partly of the citizens of Seattle. The part of the sented by a bond issue of \$5,000,000. used for condemnation of one hund acres of the highest class industrial the city, and the erection thereon back mission of a series of piers. These be leased to a Terminal Company, which will i the balance of the ground on a plan a Bush Terminal Company, Brooklyn.

So far as actual harbor improvemen ernment and the people of the Northwest a more than \$8,000,000 for waterways, letter more than \$8,000,000 for waterways. Indice and all ar work. The largest project is the Lake Washington Canal, extending from Salmon Bay 2, Lenon 3 on Lake Washington. The distance is largest the largest the bottom and from Salmon Bay to Likes Tribon be \$35 feet deep at low tide; from Lake Tribon to Like Washington will be 25 feet at low tide. with this waterway, which will be completed of 1914, the Government is now at work and lock, the second largest in the United which lock, the second largest in the United (Sinting, cool lock, the second largest in the United Sinting and 80 wide, inside dimensions. The right-observe for canni cost \$250,000, the excuvation aliquid has about \$450,000, and the executation to complete canni will cost another million, making as abrai penditure of about \$4,000,000 for this wegaments.

The great value to Scattle of this canal, spening up. as it does, two great fresh water harbors, cupp generous dock space and factory sites, as evident.

It increases the water frontage from 18 to 130 miles. The Government stands a little ever miles from 18 to 100 miles. The Government stands a little ever see half of the expenditure, the people of Seattle 22d King County the balance.

Another waterway project contemplated, is the straightening of the Duwanish River. This plan isa-volves an expenditure by the people of that district of about \$1,000,000 to construct a straight channel in place of the serpentine Duwamish River, extend south four miles from the harbor. This channel, which will be 18 feet deep, will open up a river front indu-trial tract now supplied with only railroad transpor-

Other improvements in the Northwest being built by Other improvements in the Northwest being built, by the Government are the Gray's Harbor Jetties, costing in all about \$2,000,000. The jetty on the south side of the harbor, 14,000 feet long, is completed and of the one on the north side about 13,000 feet is partially completed, and will cost when completed \$1.600,906 These jettles are for the purpose of scouring out a bar at the entrance of Grav's Harbor. Seattle fortunately, has no problem of a bar to contend with

The Government is also installing training dikes at Everett Harbor and at the mouth of the Snohomish River. These are about three miles long and cest \$125,000. The cost of dredging about 600,000 yards of \$125,000. The cost or creaging about CRAINED STATES OF differ for the channel will cost approximately \$80,000 additional. At Bellingham a waterway is being dredged at a cost of about \$100,000, involving GRAINED varies of earth At Willips Harbor an 18-foot channel is being dredged from the Bay to -Raymond, between earth and the transfer of the cost of t is being dredged from the Hay to Haymond, between seven and eight miles, involving the removal of 1,500, 900 yards of dirt, and at a cost of \$115,000. At Olympia, a waterway on the west side of the lumber is being widened from 100 to 200 feet at a cost of \$40,000. The Port Commission has a scheme improvements involving four or five municipal docks. including a large timber dock for the handling of the timber shipments of the entire Puget Sound country.

#### Exposition Relating to Accident Prevention

PERMANENT exposition, which should be of interest to inventors, has been opened in Copenhagen and has for an object to exhibit the latest and measures to prevent accidents and injuries to workmen. It is projected by the Danish Association for the Protection of Workmen, and is aided by the factories and firms furnishing the apparatus. tories and arms furnishing the apparatus. It con-tains exhibits looking to the percention of accidents by power raising, transmission, and working machines, as well as measures looking to the carrying through of regulations relating to factories; also statistics and literature. It includes an exhibition of water pages illustrating measures to be taken in attending seems believe and intermediate. boilers, and an instructive collection for the enlighten ment of the worker on dangers incident to steam beli-ers. The protection of workmen consists not only in means for protecting them from mechanical injury, but also the improvement of conditions generally looking to their health, such as a sanitary condition of the prem-ises, ventilation, insurance against accident and tilness, and it is the intention to change the exhibits from time to time so that they will illustrate advancements which may be made toward the end in view.

#### Electricity

mag for Outdoor Comfort.—Polloemen of A riskinned at street intersections all day seather, we coming in for consideration in Indianagois. That city has approtantialing at sewlve downtourn street seem-hasted "mankois," on which the seem stand to keep his feet warm.

the Textile Industry.—A large percentification of the textile industries in France Season works, and at Lyons alone stands of workmen thus employed. Electroning into use extendively, and are well purpose, and on this assount there is a standard large works in favor of domestic files of the control of the

Menals in Switzerland.—The time signals at Elffel Tower are received not only in the stage of the Switzerland, where a number of the stage of the switzerland, where a number of the stage of the switzerland, where the purpose. This is expectly spire in the watel-banking district where the time signals are useful. The steeple of the Payerna church scrept-fer port which M. Blankart has installed, and he mas nives 85 feet long stretched from the top of the spire to sharp point he slow. He is able to receive the signals from Barts at a distance of 270 miles with a very simple visions apparatus.

Electical Electricana Giffa.—Electricity contributes a surprising-unness or gift articles for serious use, for convenience and for amusement—a considerable increase for the holding, season of 1912. A recently published intemperature of the comprises ever 125 of such appeals articles in which small amounts of electric current are transformed into light, best or power, the varying applications showing the settent to which electricity has entered home life. Electric heating and cooking devices and appliances for saving labor in the household lead a list of "eiffs for women." Then there are about thirty electrical toys we addition, appealing mainly to boys, of course. Over trestly other articles suitable for men are made, and almost as many again for bedroom and unreery comfort.

The Glant Condensers Required for Steam Turbine Generaters—The importance of the condenser to the efficient operation of the bigh-capacity steam turbine generators which are now so generally used in large elected control stations is well illustrated by the new apparatus in Chicago's latest electric generating station, the "Northwest Plant," designed for an ultimate equipment of 200,000 kilowatts. In the turbine prom there are installed at present two 20,000-kilowatt vertical units, and the turbine-base condenser of each unit contains 7,000 one-inch brass tubes 17 fost long. The total effective condensing surface of 20,000 square feet thus provided is designed to maintain a two-inch vacuum when condenses abell weight 141,000 pounds.

Color Decorative Lighting at the Beston Electrical Blown—The electric light decoration for the exterior of the Mechanics' Building, Boston, where the Electrical Show opened on September 28th, includes some novel and beautiful restures coarried out under difficulties. The valis of this building are sowered with ivy (the growth of many years) which could not be disturbed, so the special decorative effects obtained by incandecent lamps are supported on falsework extending to the ground. These effects include measies of conventionalised flowers and offsage, in 4 and 8 acadie-power lamps with dark red, light red, amber, dark green and light green builts. In addition, a number of decorative lampposts bearing fame are lamps in groups of four are used, the group comprising a single pale-green lamp above and three pale reseal lamps below. Pairs of pylons at the two outs of the state of within the building stands carried threen fame are lamps each, the lamps in the two upper tiers being pale-green and the remainder rose-pink.

The Incandescent Lamp in New York Thirty Years App.—The New York Ellisettical Exposition hald October 18th to 19th emphasizes the historical aided of the electrical industry, especially the vast development of the public incandescent electric lighting service in New York city. This service to-day—well over 5 million actual lamps agreeating about 1014 million 50-wat coulvialents served from two gignatic central elatients and 31 million actual two the control of the co

#### ممسامات

Passing Gases Through Iron.—It has been known for some time that gases will pass through metals when they are highly headed, thus platinum at a red heat will allow air to pass through it. Iron is also permeable for hydrogen when hot and even when oold to a certain degree. More recently, Charpy and Bonnerot show that mitrugen does not peasters iron below a temperature of 500 deg. Cent. Hydrogen passes more easily, and at a temperature arter of 500 degrees a considerable action is noticed.

New Messetary Standard.—At the Science Coupress had at Nimes, France, a report made by M. (dohn was adopted, namely that a monetary standard be used by all countries which is adapted to the value now in use. The unit is known as the "mono" and has the value of 80.6. It corresponds to the well-known monetary units as follows: France, 4 monos; mark, 5 monos, forin, 8 monos; abiling, 5 monos; pisate, 10 monos, yen, 10 monos; lire, 4 monos; pesets, 4 monos. The dollar would correspond to 20 monos.

Prof. Lewis Boss, Professor of Astronomy in Unno. College and Director of the Dulley Observatory, Alnany, died at his home in Albany at the age of 66. Prof. Ross was director of the Dulley Observatory for Intriv-sir, years. Prior to that, from 1872 to 1876, he was the astronomer of the Northern Boundary Commission. He headed the United States Government expedition to Chila, in 1882, to observe the transit of Venus. Resently he has been director of the Department of Meridan Astronomy in the Carnegic Institution. He was a member of the National Academy of Science and foreign associate of the Royal Astronomical Society

The Care of Books.—Persons shout to matell now libraries, or those who find their books in had condition, will be glad of the advice offered on this subject by a writer in Les Anneles (Paris). Glass cases should always be avoided, except for a few presons volumes which are specially looked after and frequently dupted, since the condition at amosphere and lack of an-irrorizedation in such bookesses is favorable to the development of germs, insects, and mold. Secondly, the sumple precaution should be taken of placing on the shelves behind the books strips of doth or flannel moistened with benzine, phanol, tobacco juice or turpentine. These strips give excellent results if renewed from time to time.

Infantile Paralysis Spread by Stable Fly.—Infantile paralysis is ranamitted by the stable fly is the important discovery which Dr. M. J. Rosenau, professor of preventive modules and hygiene as Havvard, amounced to the fifteenth International Congress of Hygiene and Demography. Dr. Rosenau experimented with moneys, the animais most closely resembling man. Twelve monkeys were infected with infantile paralysis A treest stages of the illiness is large number of stable flies were introduced into the closely acreened cages containing well monkeys. These sammas safer being bitten by the flies developed all the symptoms of infantile paralysis, just as they appear in children afficied with the disease. Some of the monkeys died. Dr. Rosenau took tissue from the monkeys thus infected by the flies and unjetted them into a third set of monkeys, which thereupon developed the disease. A method for excitation and control of infantile paralysis is now placed in the hands of sanitarians. It is believed that the necessity of quarantine is thus relieved, and that it will suffice to place a bed net around the restient.

A Kinematographic Study of Street Conditions.—A. Line Cities Exposition held recently in Dissessition, Germany, the perits of street traffic were illustrated in a common the perits of street traffic were flustrated in a common to the common traffic of the common traffic and traffic and the common traffic and traffic and traffic and traffic and the common traffic and traffic

#### Automobile

Special Cars for Hunting Dogs.—Owners of large estates in England have purchased a new style of motor truck, which is especially designed for the transportation of hunting dogs to and from the rendezvous. One of these trucks will carry ten dogs, each in a separate little "stall."

A Gaseline Tank for Automobiles.— Howard E Coffin, the well-known automobile inventor of Detroit, Mich, has secured a patent, No. 1,203,098, for a tank which has a bollow partition dividing it into compartments, and the tank is provided with means which will indicate any leakage from either compartment into the hollow partition.

Number of Cars in Germany.—According to statuster quot issued by the German government, there are at part issued by the German government, there are at 20,000 motorcycles running on German roads. Thus considerable less than in half a dozen American Statos, and barely half of the number in use in New York States alone.

Venezuela Opens Automobile Line. —The Minister of Public Works at Carnose has granted a franches to some promoters who are planning to run an automobile bus into from Valencia to Nirgua. The cars, which will be used for both passenger and merchandus transportation, are to be admitted free of duty. Active operation is to begin at once.

A Vielding Tire Filler. There appears to be considerable interest in the provision of yielding fillers for tubular rubber teres. William Edgar Hower and Albert M. Woltz of Greensboro, N. C., have patented, No. 1/188-811, a turn filler which consists of pulveraged octs, sulplur and corn oil with the proportion of corn oil about three fourths of the entire composition.

Blow-out is "Higher Power." French courts have just decided that when an automobile tire "bursts" it is the influence of a "higher power," in the sense of the French law, which frees the perpetrator of any onjury from responsibility for damages caused. A touring car "blew" a tire, and crashed into a store window. A lawsuit followed, and the storekeeper lost, because the "higher power" clause was applied.

Berlin Forbids Chauffeurs to Smoke.—Declaring that the habit of smoking eigenview or organs, while in charge of an automobile, was responsible for many accidents, the municipal authorities of the city of Berlin, Germany, have forbidden chauffeurs to smoke while on dity, have forbidden chauffeurs to smoke while on dity, The order applies not only to all chauffeurs driving taxicals, but also to anyhody, whether prince or peasant, who sits at the steering wheel of a motor car. The rule has caused extraordinary exetement, but it is enforced with impartial seventy.

Intercity 'Buses for Canadas—As it, would not just in many of the provinces of Canada to build railrads for the present comparatively small traffic, it is planned to establish in all parts of the country automobile 'bus lines, connecting the various cities and villages. For this purposes \$40,000,0000 company, called the Canadian Autobus Company, has been formed and a large number of 'buses are to be installed at once. One million dollars are to be spent in Montreal alone, and other cities are to get proportionate amounts.

French Courts are Strict.— How important the proper observance of traffic rules seems to the French is best shown in the decision of the highest French court in the case of a motor truck which was not properly lighted in the rear. A passenger automobile ran into the truck on a dark night, and the negligent driver of the truck was sentenced to impresonment, to pay the damages to the passenger car, to pay for injuries received by the chauffour and, finally, to remulures the owner of the passenger automobile for the monivemence caused by the loss of the use of the car.

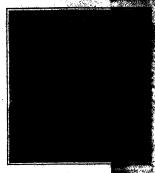
Nitroglycerine to Drive Automobiles.—Every now and then somebody comes out with a stagering proposition to morease the power of automobile. The latest plant thought out by a Houston (Trexas) man, provides for the use of nitroglycerine as a power producer. The explosive has been used before in schemes like this, musually to the great sorrow of the relatives of the inventor, but the latest introglycerine motor is not designed for pure explosive, but for a solution of it in gasoline. The inventor admits that his motor needs more "development" hat it sure of "ultimate success."

Belgian Automobile Show. The Twofith Belgian Automobile Show is to be held at Brussels in the Cu-quantenaire Paiace from the 11th to the 22rd of January next. The exposition is an international one, and there are ton general classes of exhibit, automobiles and chassis complete; motors and acressories, times carriage work; power wagons meluding either heavy or eight weight areas for handling all kinds of freight The other classes include stationary motors or groups machine tools, agricultural automobile, accommattes and the like. It is expected that the show will bring out a large number of exhibits.

Company of the Compan







Timplate Company's deta house of solid concrete exte

## Concrete Houses Versus Tenements

### Model Dwellings for Workingmen

By Marc N. Goodnow

ELEVEN New York city blocks have a density of \$1,200 people per acre, which means that if the whole of little Delaware were similarly crowded, it could contain the entire population of the world, white, black, yallow and red. This almost inconceivable city congestion means, further, that these people must live in tensements, where they are compelled to stunt and warp their own and their children's lives to fit the space resultements of their from automotines.

tenescena, where they are competed to stuft allow sections, where they are competed to stuft allow sections their own and their children's lives to fit the space requirements of their foul surroundings.

Many cities smaller than New York can boast of congestion among their sweated or factory worked, which though not so great in density is none the less insecusable in the light of the greater space over which these cities might easily spread. Where cities have grown up about large industries under the misquidance of real estate speculators, bousing conditions generally are distinctly bad. Where the industry itself has had foresight enough to prevent crowding or calpital enough to build houses for its employees, some effort has been undet to get away from this state of human congestion.

made to get away from this state of human congestion.

An example of the use of concrete as a weapon with which to exterminate the evils of crowded housing and

city congestion is furnished at Gary, Indiana, where the American Nheel and Tinplate Company is completing fourteen buildings of monolithic concrete, costing something over \$130,000, and furnishing apartments and houses for seventy-four families of workmen in its local antils. These are the beginning of a group or settlement of houses planned to accommodate eventually from 250 to 350 workmen's famline.

By improving upon former methods of pouring
concrete into wooden or
metal forms, the company
has gone a long way in
solving a knotty problemthat of housing employees
in inexpensive yet durable
houses which can be
grouped together in an attractive manner, and low
enough in cost for these
same employees one day to
buy. The same desdar was
carried out in the same
community by the Tuited
States Steel Corporation,
which erected fram to
houses and afterward disposed of many of them to
employees on the monthly
payment plan.

Estimating the cost of the finished spartments and house at \$133,000, that of a single dwelling would figure as low as \$1,908, which, in Garo at least, is a comparatively low sum. The detactor bouses, or convention of the state of the

The present investment of the tinplate company stands at close to \$200,000 for equipment, forms, materials and labor. Its forms cost approximately \$40,000, and have been used in the construction of the following houses and apartments:

Six houses at \$2,750 each	\$16,500
Three ten-apartment houses	49,000
Two ten-apartment houses	82,500
Two four apartment houses	18,000
One three-story ten-apartment house	22,000

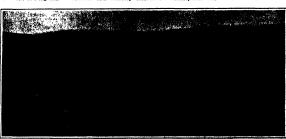
buffets are made of concrete, as well as we drains and gutters. The detached houses, t in height, are provided with shower baths, are of concrete, wood or composition. The composed of tile or gravel and tar.

The exterior ornamentation also is former econcrete. In fact, overy feature of a house with the built of indestructible material is as constant a variety of architecture which is not unplease it are yet has been secured, and the settlement is more attractive than long rows of tenement him for the tenement him or the property of the

The Edison plan for monolithic concrets consideration—that of large molds of steel into which the Haudi stone is poured—has been improved upon in the newer "sectional" forms used by the tinplate company. This

sectional forms and their accessories in the process "setting up" nu 28,000 separate pieces and comprise the equipment in as many as twenty different styles of house, cite varying in archit The frames or sections was composed of durable sh steel and constructed w flanges which can be clamped together to feet a continuous wall or fine. With the foundation at on top of the previous until the required height of the first wall has been reached. Each, floor be-comes a separate entity and fact, each room is an tity, surrounded comp ly by concrete reinfor with bars of steel or r terior surfaces are is oothed and pointed, t painted, calci plen of the swill

These houses and apa ments are built to rest from \$12 and \$15 to 1 and \$30 a month. To are estima walking a



Kirk settlement-houses erected by the Eigin, Joliet & Eastern Railroad for its employees at Gazy.



Pive two-energment halfdings faring the ten-termin home.

and me glabed septh of the smalts which comes and lifeti. There are about these houses ample a garden plots, fresh at and smallen. Their properties and cooped up on a single floor with no gives this not cooped up on a single floor with no gives the considery provisions. There are the senses obtain advantages and play room the consideren. These concrete houses are in strange may be the flat conquestion which prevails on Gary's

the arous the poorer working a training a second of the comment to come by years living and sheeting in the second of the comment of the comm

To promote or contract.

The course, there is one big objection to be a contract of this kind under the present contidious. The man and family who really need spoth advantages most are the ones wise in a great majority of cases cannot differ to pay the price. Further than that, there is very often a class distriction which makes itself painfully apparent on remain among his own kind. By constructing houses for the different grades of workmen (the basis being their smartes) on the same streets, the steal corporation overcames a larve measure of the distriction of the contract of the c

While we must commend the policy which has governed the building of these workingmen's dwellings, we cannot re-frain from pointing out how much better these things are done in Germany, at least from an artistic point of view. The Ger man town of Emen may be compared with the American town of Gary; for at Essen the enormous cast steel works of Erupp are located. The Krupps first began to build workingmen's dwellings in 1861. At first, tenement houses were erected, but in 1894 (in Alfredshof) the cottage system was adented. So far as external appearare concerned, there can be no doubt ances are concerned, there can be no doubt that these Krupp cottages are far more attractive than the houses at Gary. Be-tween 1871 and 1874, over six million marks (\$1,480,000) were spent by Alfred Krupp to provide housing for 2,400 fam-The architectural efforts of that ities. The architectural entors of that period in Essen were no more creditable than those at Gary. It was not until the Krupp works began to develop rapidly during the nineties of the last century under the directorship of the late F. A. Krupp, that the problem had to be attacked anew. In old Alfred Krupp's day, the chief problem to be considered was that of providing cheap dwellings, so that that of providing cheap dwellings, so the even the poorest workingman might have a chance to save money. When F. A. Krupp assumed the directorship, it, because the converted converted absquates. came a serious matter to provide adequate dwellings for hundreds of families. There were no adequate accommedations in Es were no adequate accommedations in Es-sen. They had to be created. This he did, from a utilitarian as well as from an assthetic point of view. Twenty minutes southwest of the cast steel factory of southwest of the cast steel ractory of Essen lies his colony of Alfredshof. It was built between 1894 and 1899, and comprises about two hundred and fifty comprises about two hundred and fifty structures for one, two, three, and four families. Buch house lies in the midst of a ungil garden; each bins a small 'waranda. Although the Krupps who compiled to thendon the cottage system because Al-redefact, outle not be farther extended, the town of Essen had grown so rapidly the

anamon to covering system consists Artendated, could not be further circuided, and bocquathe town of Resen had grown so engilely that real exists because very county, the idea with feating mental attractive dwellings was not absidened. It was necessary to return to the sensement invalue, we to conmistra designed with such good tasks and provided with sinch admirable entitient circuits about that it is light as believe that they are included for the mod-

Source of Commercial Divi Divi

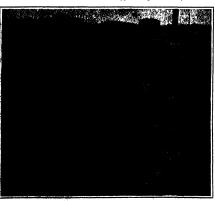
Divi Divi is the trade name for the seed pods of
a small leguminous tree botanically known as
Coscolpies corderle Willd., a native of tropical America
and the West Indies. Its natural range has been increased both to the north and south by planting. It
grows sparingly in southern Macket, but it is more
abundant throughout Central America, Colombia, Gui-



A glimpse of the workingmen's colony at the Krupp cast steel works at Essen-



Modern tenement houses of the Krupp workingmen's colony.



Preparing to set forms on the basement floor.

anes, Venezuela, and the northern part of Brazil. Under favorable conditions of growth it strains a height of fees and 50 feet and produces an immense number of small? pollow flowers which resemble those of the shipsippus free (Options loberson Linn.), which is plausied freegastic for crament in this country. There is no the contract of the contrac

which are at first straight, soon curve or bend like the letter C, but when they are fully matured they curve like the letter S. They are filled with a yellowish powdery substance and with a few dark-colored seeds. The seeds have no commercial value, but the yellowish powder contains as much as 50 per cent of tamin, which causes it to be used extensively for taming purposes. The tamin derived from these pode differs

materially from that obtained from oak bark or axis. It is said that one part or divided let's sufficient for taining as much leather as four parts of that from oak bark and the process occupies only about one third of the time. Tamers seldom used the divided tainin by itself, but they generally mit; if with oak bark and valonial tymit; if with oak bark and valonial (accorn cups of Quercus arothops Linn.). Leather produced by this means is used principally for soles.

The divid tirt tree has recently been in.

troduced into other tropical countries, but only to a small extent. In the East Indies its cultivation has been most extensive and successful Although divi divi is produced naturally in enormous quantities, a need has been felt for artificial propagation of this tree, especially in regions where it is not native. Divi divi is at present grown for commercial purposes in Java, Ceylon, India, German East Africa, and other parts of tropical Africa. It is and other parts of tropical Arrica. It is also cultivated on a small scale in the West Indies, especially in Jamaica. The cultivation of this tree is simple, and the yield is often very large. Since the yield is often very large. Since the demand for divi divi is so great, it seems advisable to recommend its planting in all countries that have soil and climatic conditions in which this tree admits of being cultivated. That it can be grown profitably on a large scale in the Ameri can tropics simply for the sake of its pods is doubtful, on account of the lack of efficient labor. It can be cultivated, how-ever, as a minor crop in a banana, sisal, or cocoanut plantation. It is also an ex-

cellent tree for shade or for wind breek. An experimental plantation was made in Dar-se-Salem, German East Africa, in 100 me, and the first crop from these trees showed that the results were entirely successful. An experienced planter from tropical Africa writes that divi divi German East Africa thrives from son level to 2,500 feet olevation. It begins to bear in the fifth or sixth year, depending upon the character of the soil and climate, and retains its capacity for production up to the twenty-fifth year. A thrifty tree is said to produce a quantity of pods valued at about \$48.25. The amount of pods produced annually by a full grown tree is about 100 pounds; by deducing 25 pounds for seeds and retuse matter, 75 pounds of good tranting meterlal are left.

Divi divi is reproduest wholly by seed. A seed bed is prepared by making with the soil thoroughly rotted mature in the proportion of 2 to 1. The seeds are then placed 8 inches spart each way and about 3 inches deep. The bed much be properly shaded, at level during the hottest part of the day, and the soil must be kept constantly model. In about ten days the young swellings will appear above ground, and when they are shoult 4 or 5 inches high, shading may be discontinued. Nor will it be necessary to water the seedlings regularly every day unless the wonther is every hot and dry. When the young trees are about a foot high they are according to a seed of the property of the proper

during the first three months The care required thereafter consists simply in keeping down weeds until the trees thoroughly shade the ground, which is about the time when they begin to bear fruit.

The pods are picked off when they are deep brown, dried thoroughly in the sun and packed in base for shipment. The principal countries from which the American tanners derive divi divi are Colombia and Venessuels. Although small amounts are grown in the Guianas, Brasil, and in parts of Central America, it is not imported into this country.

#### The Barocyclonometer By C. F. Talman

THE dreaded hurricanes of the West Indies are iteal affairs than they have ever been before, in view of the diversion of trade routes to the Caribbean Sea which is to follow the opening of the Panama Canal. The attention of our Government has been directed to the necessity of a renewed study of these disturbances and the means of protecting vessels from them. The Weather Bureau has now in the press a bulletin on this subject, from the pen of Dr. O. L. Fassig, lately in charge of the meteorological station at San Juan, Porto Rico. Moreover, it is understood that the same Bureau is planning the establishment of several new shore stations in the West Indies, and has already ed the services of special marine observers aboard vessels in the West Indian trade, who now send twicedaily reports by wireless telegraphy to Washington. Similar considerations have led the Navy Department to adopt for use on the North Atlantic a device called the barocyclonometer, which has proved of great value to mariners in the Far East in determining the proxim-

y of typhoons This instrument was invented by the Rev. José Algué, S.J., director of the l'hilippine Weather Bureau, in 1897 It may be regarded as the outgrowth of several earlier and relatively crude devices for enabling mariners to locate the direction of a neighboring hurricane from local observations, viz.. Piddington's horncard, Reid's storm-card, Lloyd's typhodeictor or storm-pointer, Viscovich's cyclonograph, Vifies's cyclonoscope, All of these devices depend upon the fact that the winds around a tropical cyclone have a definite rela-tion to the position and movement of the center, and

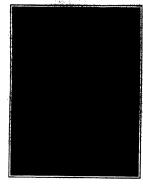
then to the position and investment of the center, and thence to the state of the barometer.

The barocyclonometer is a signal improvement over its predecessors because it takes account of the fact that the normal barometric pressure—a marked departure from which gives token of a neighboring hurricane -is not the same for all parts of the ocean or for all seasons. It consists of two principal parts, as shown in the accompanying picture, which represents the form of the device now used in the waters of the Philippines and the China Seas To the left is seen a special form of anerold barometer. The barometer proper occupies the center of the dist, and is graduated in both metric and English units. Surrounding this is a flat ring of silvered brass which is movable around the barometer The first step in the use of the instrument is to set this ring in accordance with the indications printed on its lower half. For each zone of latitude and for can be seen and for each some of actions and for each season there is a definite pressure above which the conditions may be regarded as normal, i. e., if the pressure is above this limit, at the piace and time in question, the mariner can be certain that no eyelone exists within a radius of 500 miles. The ring is turned until a red arrow, shown to the left of the segment marked "Variable," points to the reading of the barometer dial corresponding to this normal pressure. If, when the instrument is thus adjusted, the index of the barometer points to a reading to the left of the red arrow, the vessel must lie within a cyclonic area. The segment of the ring marked "typhoon" will then embrace all readings likely to occur within the cyclone. The latter is divided into four concentric zones, A, B, C, and D, at various distances from the center of the storm. Having ascertained from the barometer the

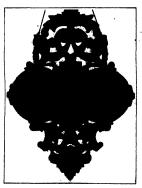
proximity of a storm, it is of the utmost importance to know in what direction the storm center lies from the and the direction in which it is traveling. This is determined by the use of the cyclonometer, shown to the right. The glass face of the evelonometer is immovable. It is marked at its circumference with the points of the compass and with eight diametrical lines with eight dinmetrical lines emgraved on the glass. Beneath the glass cover is a metal disk which can be revolved by a knob at the center. An arrow passing through the center of this disk (only the reduction be. disk (only the point can be in the picture, close to the knob) represents the di-rection of the storm's move-The other little ar rows engraved on the disk the direction of the winds around the center, as determined by innumerable These winds have a general right-to-left rotation around

the storm, and are also inclined more or le tello atr the center. The consentric circles seen on the disk mark the limits of the four sense of the storm, 4, B, G,

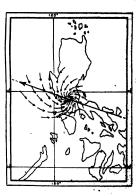
The two long needles pivoted at the central knob and movable about it are called the "graduated needle" and the "double needle." The former has the inner



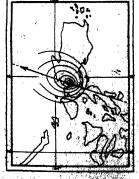
Father José Algué, S.J., director of the Philippine Weather Bureau and inventor of the barocyclonemeter.



An instrum dicates the proximity typh



Trajectory of the storm and disposition of isobarometric lines round the vortex.



Either of the large most of so that the direction of a cyclone's path in question; the needle is the ding to the fire the ship, and lying in the app or end of the arrow will then i onding to the direction from the ship. The use of the second somewhat complicated operation, of w the description here. It is fully say work on 'The Cyclenes of the Far E Several modifications will be made to adapt it to the barometric and v the North Atlantic.

Solid OH as a Marrine Fuel system of the state of the sta tion of the existing apparatus. Not only are sp oil barners needed for the furnaces, as well as veg-ing appliances, but the devices for leading the M combustible on board would need to be changed, sides, great storage tanks are needed for the lig sides, great storage tanks are needed for the liquid, and the action of the latter upon the walls of the tanks would be strongly felt when the vessel is reliking at sea. It was decided quite recently at an important making of abhowmers at London to go lator the production of solidisfied petroleum brickets on a large seals. These are obtained without any great chemical manipplation. The crude oil is boiled and to it is added a quite manifest of the start and with the all solidities of the seal of the start and with the all solidities of the seal of the start and with an allowing solidities. action. The crude oil is boiled and to it is added a tita amount of stearie acid with an alcoholic solution of equatic soda. Upon cooling, there is obtained as transferrer mass consevants resembling givering comp, and it has sufficient cohesion to allow of making it into equater-shaped brickets. These are easy to handle, as they are not brittle now do they cause dust. Such blocks have a low and very require construction owing the control of the control of the control of the control of the such control of the control of the control of the product of the control of the control of the product of the control of the control of the product of product produ to their unformity of structure. The weather does not seem to affect them, and they always remain clear. Even boiling water is said to have no effect on the brickets. The heat production from them is such that a ton of solidified petroleum serves instead of 24 tons of coal. The great saving of space on shipb evident, and another point is the great all-aroun ony realised for producing an equal amount of seam. Some British naval sugmeers studied the question and concluded that for a single trip of a Cunard liner from England to New York and return the lowest figure for Engiand to New York and return the lowest figure for the saving would be \$80,000. They also reported the following points in favor of the new fuel: 1. No appreciable modification of the furnaces or bunkers is needed. 2. The brickets hear very well in open furnaces. 3. They have a very high saloride power. 4. No inflammable gas is given off under the action of heat in the furnace. 5. They hura alowly without running of figurity, nor is there any crackling or explosion. No ash is left. 6. Their regular shape facilitates storing, and there is no space lock. 7. The brickets harden with time and reach a great crush-

time and reach a great crush-ing resistance. 8. The range of the vessel will be much increased, which is a capital point for war vessels. From another point of view, it is held that the nevigation panies will be more inclined to increase the speed of the ocean liners, since they pressure at a much l whole, the new and pears to be a profit and a great smooth rove to be rigid ! sture, for liquid could only be sible

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differe and not responsible for an reducin. Anonymous communi-ared, but the names of corresponder

### sic's Death Not Due to Gyrescopic Action

To the Editor of the Sommire Am

he's acquisents on Paul Pock's fatal flight, ared in the Scienzisto American of Sep-

Mr. Peropin's arguments on reconstruction of September Sheh, 1913, are based on false premises.

Mr. Strummet, the builder of the acroptance, and mynistrees present and washood Feels, and we observed that before he began his spiral dip he shut of the motority has before he began his spiral dip he shut of the motority he significantly and consequently me grotosipile, acrien sould have derveloped during all the time he came down.

Mr. Brecoles wishes to take a stand against revolvancy finder motors, let him at least stick to facts and not distinuished his imagination into twisted arguments and fallescone conclusions.

R. S. Moorr.

#### The Columbia River Jettles

To the Editor of the Scenerurio American.

J. P. McIndoo, Major, Corpe of Engineers, U. S. A.,
makes the fellowing statement in re south josty, mouth
of Columbia River, in Sceneruro American of October
18th, 1912: "It's condidently expected that it will be
completed in the early spring of 1913 and that its maintensence will not require the dumping of more than a
small amount of rook in the next few years, while the
trustle regarding nerviceable," "On.
In the annual sport of the Chief of Engineers, U.S.A.,

an annual report of the Jame or Engineers, U.S.A., dated Ootober 14th, 1911, Major Molando says: "The sevised estimate, approved April 17th, 1909, for the completion of the routh jetty was \$3,529,500, and is based on a report made by the district officers, recomband to the completion of the routh jetty was \$3,529,500. Design on a report mane by the mission connects, recom-mending that the jetty curvolument be raised to at least mean tide level, and that its creek be given a width of not less than 25 feet, in order to protect the treate pilling from early destruction by storms and teredo. The increased cost is due to the greater amount of The increased cost is due to the greater amount of tone required, the increased cost of materials, and the heavy loss during construction in previous years, due to destruction of the treatie by winter storms and teredo. In some places the jettly to boting built in depths as great as 39 feet, and with 15 feet increase in the width of the creek, it becomes at once evident that an enormous increase in the amount of rook is required. The life of the treetle is very uncertain, and the work of reinforcing the rock must be done before the treetle comes unserviceable. . . Amount required for ex-setture in fiscal year ending June 30th, 1913, \$1,000,-

doe, of course, has the right to revise in September, 1912, what he wrote in October, 1911. It is a habit with Government engineers to make such It is a habit with Government engineers to make surevisions periodically, and no doubt the next Congrewill be officially informed that the south jetty is comple win to omnative instead of requiring nearly four million dollars more, not another east will be needed. Major Meindoe, however, must not blame publicists for using mentance, powers, mass not some pumous or tame the data he presents to Congress in order to get con-stantly and enormously increasing appropriations, in preference to data he keeps in stock for local use. Personally, I do not feel all concerned by his denial of some statements I made in the Scientific American

in describing the jetty work at the mouth of the Columbia River. My statements therein are his statements to bla River. My statements therein are his statements to Congress and my deducations therefrom are the inevita-ble conclusions from his statements and are merely con-clusions. These deductions rafer to the time it will take to create a 60-foot deep channel at the mouth of the Columbia River and they, of course, are fallible, being deductions. Fasts, however, are infallible, and here are the facts on which my deductions were made, from page 1016-0g his reporter. "Storth jetty commenced 1885," 27 years ago. "Depth of the contract of the 10 to 21 feet. Depth of wave in 1904.

norm pump 11/10-sq. Bill reports
"South picty commenced 1885," 27 years ago. "Depth
of water at bar. 19 to 21 fest. Depth of water in 1985,
with 45 miles of jetty done, 21 fest, and in 1890, 28
fest. By 1802 the depth hald deteriorated to 21 fest,"
where it was 17 years provincing. "The maximum of
1810 was 28-1/2 feet and ef 1911 was 27-1/2 feet." an
increase of 61/4 feet in rines years. The deduction is
that at the presum rates of inscrease stated it will require
183/2 years to secure 48 feet depth.
The may be that Miles's Milesdades will accorded it is
The may be that Miles's Milesdades will accorded it is
The may be that Miles's Milesdades will accorded it is
anticipated 21,000,000 in that times, in completing the
south jets's tim the early ageing of 1913," but it will
be winted by the third of the second could be and
work involving its formelies laved. Milesdades and destroy it, and
work involving the formelies laved. Milesdades and destroy it, and
where, 1806 festage law in 1961 in the next water
1866 feets of the feet water.

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1866 feets of the feets of the feets of the feet and winter
1866 feets of the feets of the feets of the feet and winter

IWe are informed by the engineers on the work that I've are informed by the engineers on the work that it will require not to exceed six years to build the north jetty; and that this will place the time in which Port-land can hope for a 40-foot depth at not to exceed seven years, at the end of which period, they assure us, both jetties should be completed.—Entron.

#### The New York Electrical Show

THE New York Electrical Exposition, popularly This New York Electrical Exposition, popularly known as the "Electrical Show," held this year in the new Grand Central Paince, October 9th to 19th, is an advance over former shows in the demonstrations of actual devices and in the educational exhibits setting forth the increased utilization of electricity. A distinctive feature of the present show is the presentation of the historical side of the electrical industry.

It was just thirty years ago that the first Central Station for providing public incandescent electric lightstation for providing public incandescent electric light-ing service in New York city was put in operation by the initiative of Mr. Edison, and very largely by his personal labor; and this year's show was fittingly opened by a luncheon given in his honor.

Heating and cooking devices have always been much evidence at the Electrical Show, and this year the variety and ingenuity of these articles is greater than ever. Among them are an egg boller, itself of attractive egg shape and holding five or aix eggs at once, a samovar with removable tea-ball, a frying-pan that may be turned upside down for making griddle cakes, and a combination utensil by means of which one may prepare an entire breakfast—cooking a cereal, making prepare an enter treatment country is careat, making to cast, boiling or frying eggs, and broiling bacon, steak or chops—by changes and combinations of the movable part. Complete electric ranges show a remarkable advance over last year. A large space is given up to a tea room for visitors, with many little tables where

tea room for visitors, with many little tables where electrically cooked visited are served. The United States Government is well represented. Exhibits are made by the Census Bureau of tabulating and statistical machines, by the Bursau of Mines of mining apparatus and of an oxygen resuscitating equip ment for miners, by the Reclamation Service of photo-graphs of the arid lands of the West in their original ert state and after irrigation and of the vast engi ring works for providing hydro-electrically generated power and irrigation, by the Navy Department, the Bureau of Navigation, the War Department, the ATT Signal Corps. and by several Bureaus of the Department, the ATT Signal Corps. and by several Bureaus of the Department of Agriculture. The Electrical School of the Brooklyn Navy Yard has a striking exhibit with the bluejacket students in attendance and including a 20-kilowatt wireless telegraph installation with which a 20-zinewart wireless message will be sent to the Pauama Canal. The Isthmian Commission provides a large operative model of the Gatun Dam, locks and epili-ways. Investors' models and drawings relating to the early history of applied electricity-the Wallace dynamo and are light, the Page motor, the reciprocating electric engine and certain other apparatus of Prof. Henry, and a model of the Morse telegraph register—
are contributed by the Smithsonian Institution. New
York State furnishes an operative model of the use
of electricity on the Mohawk River at Yosts.

As in all "shows" of this special character, many

exhibits, demonstrations and selling booths are found that have no direct connection with the main object that have no direct connection with the main object of the show. One of the most interesting among the strictty electrical applications shown is an exhibit bearing on the problem of the food supply, via. the attendation of plant growth by electric radiations and electrified irrigation. A good-size model greenhouse is installed to demonstrate what may ultimately be done by electricity in the "forting" of graden truck to obtain early fresh vegetables and in increasing the wind. This demonstration supresents an acricultural This de monstration represents an agricultural art which is still in the exp art which is still in the experimental stage. An actual utilization of electricity in connection with farming is set forth in large photographs, including those di-played by the Reciamation Service, already mentioned A considerable space is given over to electric incu-bators and their products, including an actual barn-yard scene with several family groups of mother hens, ducks, and Guinea hens and their artificially hatched ctric lighting naturally figures largely in broods. Electric lighting naturally figures largely in the show, both in the litumination and decorations of the building and in the special exhibits of the progress that has been made in electric lighting, including prog-rees in temperal frame. An improved form of the se-called "standight-line" filament lamps, giving an evenly distributed limination for cleak, deserves mention. The demonstrations of commercial work include elec-The demonstrations of commercial work include elec-tric 'upon' swiding, small power applications, the lead storage betterg, and the Edison storage battery shows with the absolutery machine used to test the endur-ance of 'fie' swigst-tion cell to mechanical shock, the storage diffusion alternating current rectifier, instruction distinction on reading the electric meter, motor delvan isolation described to the control of the motor delvan isolation described.

Among household applications of more or less novelty and use are "general utility" motors and novelty and use are "general utility" motors and "pow-er tables," improved types of vacuum cleaners, wash-ing machines and other labor-saving appliances. Sev-eral of the electricity supply companies of Greater New York and vicinity display instructive charts, automatic stereopticon views and photographs showing the growth and utilization of their product, in line with the remarkable activity of the "new business departnts" of the central station companies nowadays; and the Brooklyn Edison Company has a 100-foot ama of the Brooklyn water-front, realistically illuminated, to set forth the desirable features of that borough as a location for manufacturing enterprises.

The electric vehicle exhibition comprises many makes sasure carriages, commercial cars and industrial trucks. Special provision is made for the "demoustration" of all kinds of cars, including a ten-lap track surrounding the third floor of the hall and realistically arranged to simulate the real outdoors Instruction in driving electric carriages will be given to women visitors, utilizing special appliances to make

#### Sinhalese Iron of Ancient Origin By Sir Robert Hadfield, F.R.S.

THERE being little definite evidence regarding ancient iron, the author describes some specimens from the buried cities of Ceylon. His paper supplements one by Dr. G. Pearson, read to the Royal Society in 1795, on Indian steel of modern manufacture.

In 1705, on limin steel of modern minutacture. The specimens investigated, obtained from the Colombo Museum, through the kindness of the Governor General of Ceylon, Sir Henry McCallum, are (1) a steel chisel, fifth century A D.; (2) an ancient nail, probably of same place and date; (3) a bill-hook. This date has been verified by Dr. A. Willey, F.R.S. Examination of the chisel showed:

8i 8 P Mu 0.12 0.003 0.28 ntl 99.3% Difference being sing and oxide

The Fremont shear test showed 16 tons per square inch elastic limit, 20 tons per square inch breaking load. The shock test showed 17 kilogrammes with 85 degrees bend before breaking. The Brinell ball test showed hardness numbers 144 and 144 on opposite sides. The scieroscopic hardness was 35. The trans-verse section shows the specimen to be somewhat carsides. bonized, with carbonized areas on two sides. The presence of Martensite and Hardenite suggests the important information that the chisel was quenched.

portant information that the cluster was quenched.
The analyses probably represent the only modern
complete determination of the composition of authentic
specimens of ancient from The percentage of phosphorus, though high, does not greatly differ from modern bar iron. Sulphur is extremely low, showing the employment of a very pure fuel. There is very little silicon, while manganese is entirely absent, which is somewhat remarkable since nearly all iron contains some manganese.

From microscopical examination and other tests it results that the specimens represent wrought from rather than steel They somewhat resemble puddled iron, and seem to have been made from rather impure The percentage of carbon is low, as is the case of other impurities with the exception of phosphorus Slag is present in considerable quantity in a lumpy. pular form, indicating that the material was submitted to the amount of forging undergone by modern wrought iron.

The author has also been able to obtain specimens from the actual Delhi Pillar. These have been analyzed, and it may be interesting to give the composition, which is as follows:

C 81 8 P Mn 0.08 0.046 0.006 0.114 nil 8 Specific Gravity 7.81%. 99.72 09.960%

The iron percentage was determined and not taken bу

It will be noticed that this material is an excellent type of wrought iron, the sulphur percentage being particularly low, 0.000 per cent. This indicates that sed in its manufacture and treatment must have been very pure, probably it was charcoal. The phosphorus percentage is 0.114 per cent. It will also be noticed that there is no manganese present, which is a somewhat special point, as wrought iron usually ins some manganese.

This is probably the first time that a complete analysis has been given of the material of which this pillar is composed.

Both the analyses now given represent material of almost similar composition. This is somewhat remark-able in view of the fact that these specimens were taken from places widely apart. The processes then prevailing of manufacturing this ancient iron were. rever, evidently very similar in different parts of is.—Proceedings of the Royal Society. A. Vol. 86. 1913; also of the Iron and Steel Institute, May, 1912.

## Landsman's Log Aboard the United States Destroyer "Patterson"—II.

By J. Bernard Walker

THERE is a sharp word of command from the bridge, followed by a crash, a reverberating rattle, and a prolonged shudder throughout the whole fore part of the ship, and we are at anchor for night, or rather for the early part of it, within a mile of the clustered buildings which house the summer visitors to Block

The day has been a characteristically husy one for the torpedo-boat destroyers. We were under way at five in the morning and have been coaselessly engaged in a variety of maneuvers for the last twelve a unriety of maneuvers for the last twelve hours. It seems to me that we have put in a streamons day's work; but a wire-less has just been received from the Admirat, giving the programme for a sories of night maneuvers, which will necessitate our ketting under way at 10 P. M. for an all-night stretch of the most exciting, and certainly the most trying, of the duties which fall to this severelyorked branch of the naval service.

It is not of the night work, however, that I am now to write; I shall rather make some notes on the work of mine sweeping, which has formed the exercises of the day now drawing to its clos

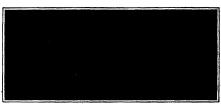
The torpedo bont, or rather the destroyer, as it is called (torpedo boats are no longer built for our navy), has undergone a development in size, speed and power, and the culargement of its field of operations, which is as great and probably greater than that of any type of warship. The earliest torpedo boats were such diminutive craft and of such limited speed, that their activities were confined chiefly to the she)tered bays and harbors of the constline; and even in that re-stricted sphere their value was very problematical. The first boats built for the British Navy in the late seventies and early eighties were little craft sixty feet long, seven to eight feet in beam, and of a displacement of from fifteen to twenty tons. Their best speed was from sixteen to seventeen knots. In 1885 the displace-ment had increased to forty tons, and in 1980 to eighty-five tons, the speed ranging from eighteen to twenty-two knots. Many of us still remember the "Stiletto," built by Herreshoff at Bristol, Rhode Island, in 1886. We were very proud of the funous craft in those days; yet she was only eighty-eight and one half feet in th, with a displacement of thirty tons, and her best speed on trial was a triffe over eighteen knots. In 1890 we were building boats of 120 tons displacement. In 1980 the displacement had risen to 165 and the speed to twenty-six kn and by the year 1904, at the time of the Itueso-Japanese war, the displacement of the torpedo boat (or destroyer as she had come to be called) was between four and five hundred tons and the speed had risen to thirty knots.

Now this war afforded a very severe test of the all-round value of the destroyer It struck the first vital blow and gave to the Japanese fleet an ascendency which was never lost throughout the war. The Japanese put their destroyers to new uses They employed them largely as dispatch boats, and for scouting and other s which took them out upon the high sens and called for extended cruising. The destroyer assumed a new importance. Its sphere of operations was greatly enlarged, and the advantages of greater displacement and better sen-keeping qualities were immediately recognized. Since that war development has been rapid. To-day, scouting duties with the fleet baye been largely handed over to these craft. which now perform much of the work formerly allotted to the unprotected eruiser Within the next three or four

The present series of articles is a record of impressions gathered by the Editor, on a week's cruise abourd the destroyer "Patterson," de the summer maneuvers at the eastern entrance to Long Island Sound.



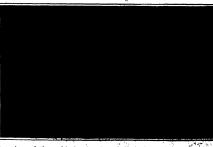
Destroyers clearing mine field by "sweeping."



boats recovering a mine which has been broken adrift by the sweeping aperations. One of the "Patterson's" b



From the sailing cutters the mines are lowered into n



Lowering a platform with six mines from the deck of a battleship to a selling

years, we shall see destroyers of from one thousand to fifteen hundred tons dis-placement, of thirty-five knots speed, and provided with a fuel supply which will give a greatly extended radius of action company with the battleship fie

Our orders for the day were to pro Our orders for the day were to proceed to a point off Watch HIII. There would find a feet of haife-dozen battle stips, surrounded by a mine field, will had been laid over might by the consein and through which, by the operation known as "sweeping," we were to open a channel for the eccape of the fiect. Although the mines were supposed to have been planted by an enemy, as a matter of fact they had been laid down by the battleships themselves; and before pro ing to describe the sweeping operations arried out by the destroyers, it would be well to explain the character of the mines and the method of planting a mine

The mine consists of a hollow metal ere, loaded with one to two hundr pounds of high explosive; a cylinder loadpounds of high explosive; a cylinder load-ed with ballast; and a connecting length of wire cable. The loaded cylinder is lowered to the bottom and serves as an anchor to hold the mine in place. The mine with its explosive is connected to the ground anchor by the cable, which is so adjustable that the mine will float at a predetermined depth--say from tw a proper mined depth—say from twelve to fifteen feet below the surface of the water, the cable paying out or taking up, as the tide rises and falls. The spherical mine with its charge of high explosive being buyons. ing buoyant, tautens the connecting cable and floats at the desired depth, which is so chosen that the mine will strike the submerged hull of a warship well below the surface of the water. The mines are laid in successive rows, which are so placed with regard to each other, that a ship which might pass through the fire row will be certain to strike a mine of the second or third row.

Each battleship carries a complete outfit for mining operations, and the seamen are instructed how to load the mines, adjust the automatic firing mechanism. just the automatic firing mechanism, con-nect up the cables, and put everything in ship-shape condition for mine-planting. The large illustration shows the crew at work on the quarterdeck of a battleship,

assembling the mines ready for planting.

The mine-laying is done by the ship's beats. Stout timber platforms are constructed on the deck of the battieship, and along opposite sides of this are placed three mines with their respective anchors suspended over the sides of the platform. The ship's boats are brought alongside and platforms are lifted from the deck of warship, and lowered down upon the gunwales of the boats, as shown in the accompanying illustration. When the boat has been towed to a designated posi-tion in the mine field, the anchors are lowered in succession by means of small cranes rigged at bow and stern of the bests, and the spherical mines are dropped over after them. Bow after row is planted at suitable intervals, until the hole channel has been covered. In yesterday's exercises the flee

In yesterday's exercises the flost made its way out of a harber meanced by a group of submarines. To-day it was supposed to be forcing its way out of the same harbor through a mine field. Yes-terday it was the duty of the destroyers to detect, and if possible risk, the submarines. To-day it was the duty of the marines. To day it was the duty of the destroyers to open up a wide channel through the mine field, either by resporting the mines or by exploding them.

The first thing to its done was, to say out a course on which the channel was to be cleared. Accordingly, the Taylor-

The state of the state of

setting under wireless instructions from the Ad-The surface and the surface and the surface of the were differn feet below the water and the destroyers draw anly eight or nine feet) to the fleet.

41.

A STATE OF THE STA

Two of the destroyers then took station a few hun-dred feet apart, and a length of chain cable was payed out from the stern of one to the stern of the other boat. The ends of the chain were made fast to two lengths of towing cable, and it was allowed to drop to the bettom. The two destroyers then steamed across the mine field in the direction of the "Patterson" at a speed of three or four knots, dragging the chain cable over the bottom. As the cable encountered the anchors of the mines it would slip up over them and catch the wire rope extending from the anchors to the buoyant mines above. Under the pull of the destroyers, these ropes would slide into the bight of the chain; and, if s were not theoretically set off by the sh the anchors, the anchorage ropes and the mines them-selves would be dragged along by the destroyers clear of the mine field. A little to one side of the course

ing would have to be carried on under a heavy fire. Similarly, if the ship's boats attempted to plant a mine field in the approaches to a harbor, the work would in all probability have to be done under the fire of the enemy's scouts or destroyers.

But, dangerous as this work will inevitably be, the history of our navy has shown that the greater the of any given service, the greater is the enthusiasm of the officers and men to undertake it. Popularity of any naval service is gaged, not by its dangers, but by the magnitude of the results which can be ved. The experience of the Russo-Japanese war showed how deadly are the torpedo and the submarine mine; and it is certain that the navy which is highly proficient in mining operations, whether for attack or defense, will have a strong physical and moral advan-tage over an enemy that is deficient in this kind of warfare.

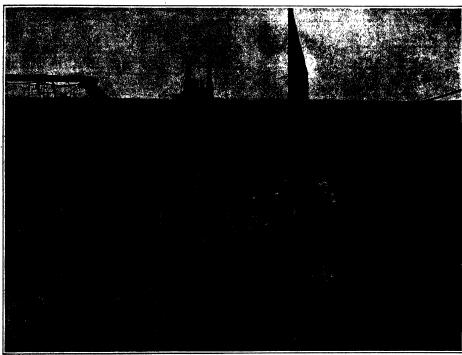
#### Lightning and Our Forests

BULLETIN 111 of the United States Forest Service is a contribution to an unexplored field of research which promises to stimulate new and fascinating in-

an explanation of the results of the author's own data and experiments. It is, however, a most admirable endeavor and is executed as well as the nature of the subject probably permits. All who have made a study of lightning and are acquainted with the paucity of reliable printed matter dealing with the subject, are familiar with the difficulties that surround the de cipherment of what records there are. The author's own figures are all based on reliable data and his conclusions will probably stand the test of much more

customs with promainly stated the test of much more extensive researches, which others may conduct later. This bulletin, which can be had for the asking, should be in the hands of every forest officer in the country. The publication should not only be in his ssession, but it should be read very carefully There are very erroneous impressions in the minds of the lay man to the effect that certain trees are more liable to be struck by lightning than others, and the general public should be familiar with the findings as set in this bulletin. The author's conclusions are as follows.

1. Trees are the objects most often struck by light-ning because: (a) They are the most numerous of all objects; (b) as a part of the ground they extend



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Mining operations in the Atlantic Fleet. The crew of a battleship are here engaged in assembling the mines ready for planting

thus swept over-by the first two boats, another chain was dragged, clearing another hundred feet or so, and then the third pair of destroyers dragged their chain across the mine field. As the destroyers reached the "Patterson" they bore off to port or starboard, dragging the captured mines clear of the channels. Finally, another pair of boats worked over a wide area through the center of the channel thus cleared, so as to make sure of removing any mines which might have escaped

Theoretically, the channel was successfully cleared, Theoretically, the channel was successfully cleared, and the fixet stemed out through the mine field without the loss or injury of a single ship. Let it not be disagneed, however, that inthe-laying or mine-weaping will be the comparatively simple operation which we disagneed that incoming. As a matter of fact, is to one of the comparatively simple operation which we disagneed that incoming. As a matter of fact, is to one official most disagneed that incoming has been provided that the comparative of the provided that is a simple factor of the comparative of quiries. The author's aim in the work, as he has clearly outlined it in the introductory paragraph, has been to arrive at some definite conclusious regarding the relative frequency with which trees are struck by lightning, the conditions which tend to produce the greatest danger, and the relative susceptibility of dif-ferent kinds of trees. With the advent of a scientific terent sums of trees. With one sevent or a scientific fire protection on the National forests naturally came a faller imputy into the causes of forest fires. The result, has been the compilation of Asta from all parts of the United States relative to the frequency of forest free Trees lightning. The data have been gathered chiefly on the Negleoni torests by nearly 3,000 forest. In addition to these field data extellate above the beautrest of the Negleonia were conducted with a view to omeon.

The state of the state

of the history of past investigations, a discus the theories and beliefs held by the layman, as well as upward and shorten the distance to a cloud; (c) their spreading branches in the air and spreading roots in the ground present the ideal form for conducting an sectrical discharge to the earth

2. Any kind of tree is likely to be struck by light-

- ning.
- The greatest number struck in any locality will
- The greatest names which in any locality will be of the dominant species.
   The likelihood of a tree being struck by light-uing is increased:
   (a) If it is taller than surrounding trees; (b) if it is isolated, (c) if it is upon high ground: (d) if it is well (deeply) rooted; (c) if it is se best conductor at the moment of the flash; that is, if temporary conditions, such as being wet by rain, transform it for the time from a poor conductor to a good one
- Lightning may bring about a forest fire by ignit ing the tree itself or the humus at its base. Most forest fires caused by lightning probably start in the humus.

## Aviation at the French Manauvers

## Military Use of the Accoplane by the Leading Air Power

By Stanley Vale Beach

Althol GH the chief use of the aero Althors was that for military purposes france was the first country to mil v this modern machine in the ma the maneuvers of I icardie in 1910 three if in acr planes were supplied by the number turns for the purpose of show he, what could be done. I ast year military aviation had become half way or a alzed and there were a number of aero three arranged in groups of three or fines arranged in groups of three or fur but the commander in the fide not make much use of these and did not recog the all their possibilities. This year avia tin has advanced by such leaps and not planes on the ground and these ma chines were all arranged in separate es endrilles or groups consisting of from the to eight machines each. The gen rais in command were able to call upon the pilots of these accoplanes to go out on sconting and message-carrying trips at a moments notice and so well did they accomplish this that there were no acci and the headquarters of each army was always posted as to the latest movements of the enemy. The arrangement of the of the enemy. The arrangement of the armies in the maneuvers this year was

The Blue Army located in Anton and commanded by General Gallieni included the 10th and 11th Corps and the 1st Division of Cavairy while the Red Army scattered along the upper Creuse and communical by General Murian Included the 0th Corps the 3rd Division of Infan Cavalry With the division of reserves the entire number of troops was about 120 000 the whole being under the direction of the commander in chief General Inffit.

The two contending armies were provided with four escadrilles of aero lanes an escadrille containing on an average six machines. The Blue Army free consisted of two escadrilles of Henri larman two scated biplanes one of litriot monophines and one made up it of Bitriot and half of Borel mono lines. The Red Army on the other lind hid one escadrille of Depar dussin two scated monoplanes, one of Maurice Latinan biplanes and one of Hanri t monoplanes while the forth was a mixed escadrille of three-seaters in cluding two Deperdussin monoplanes two Breguet liplines and two Memport mono planes. Inch accopiane was obliged to carry the accessary spare paris and each trmy had itsides a complete equipment f m to waishops etc consisting of re mot a truck f r court two peroplanes Ohe of our illustrations shows a portable repair sh p which consists f a large van e ntaining a lithe grinder vise and all the various () is and necessary equip-ment for pairing the engines and every part of the machines. When the repair aut mobile is moving along the read the init of th sides fid up and make a closed van but wher it is jut into use on the field sides are from old we as shown in the linetration and thus making ample work benches for the mechanics. For the transportation of acts lanes when transportation of accipiance when they do not fiv from Joint to point large two wheeled vans are provided in which the neroplanes are placed semi-dismounted condition and drawn from point to point by attaching the tw wheeled van to the rear of a motor truck

The maneuvers of the West us the were called this year occupied two weeks from the 8th to the 21st of September Operations began on September 11th when the two sirships used in connection









Repair automobile with side lowered to form a work benili,



the lengthy flights made rs. which la of the forty-eight acroplans eleven were temporarily dis theless, General Gallie inted his aviators on the shundance and correctness of the information they gath-ered. He stated that he had made his decisions largely on this information, and that he had never found himself in a lad

position from having done so
As all the military pilots were skilled
aviators and had had experience in flying, aviators and had had experience in fring, it is not to be weakered at that the re-ports they gave were wonderful in their accuracy and detail. The fact that each aviator generally has a companion to take note of the country below him and report on the movements of the troops, made it all the move needs of the troops, made it all the move needs to fire accurate information. In one instance a well-known aviator landed baside Grand well-known aviator landed beside Grand Duke Nicholas of Russia and gave him personally a report of his scouting fight. The Grand Duke was so anthused at receiving this information that he had the officer sign the report, and he sent it to Russia to show what is being accom-plished by the French military aviators.

In addition to this gleaning of acc ate information promptly by the stor such information was at the disposel of merals instantly by means of wireless thy The Farman biplane of eatelegraphy The Farman biplane of es-cadrille No 2 was fitted with a new wire-less transmission set, the invention of M uset. This set consists of a small name driven from the aeropiane motor dynamo driven from the acroplane motor by means of sproxiets and a chain and shocking not more than half a horre-power, and an autonam consisting of a wire about 130 feet in length—sufficient for transmitting measures a distance of 63 gailes. The weight of the entire ap-parature is but 68 pounds, and the space to occupies is 10 by 10 by 38 lunches high. During a two-hour reconnotier on 6sp tember 30th, in wishet the investor was at the key of the instrument to the serv-tians. measures were seet continuously. plane, messages were sent continuous during the flight and headquarter during the flight and headquarters was hept in touch with all that was going on about the field. When the aeroplane was at a height of from 1,650 to 5,250 feet, the communication was perfect. Fog and cleads were often interposed between the seropiane and the receiving station, but neither affected communication. This new system has the advantage that there is no interference with other statio only the special portable pecsiving flows can catch the messages from ata-the tions can catch the messages from the aeroplane. The apparatus is so simple that an ordinary supper san, after about

one of sending messages.
After many more excellent files made during the course of sabuters, the latter was grand review of the as Decand, Minister of the two on September 22

prints herwith between a define for societing dirigibles solicy in the cison age, which for theosested rescens are been represently recommended in the elitants of this paper, and which has been full too the present and which has been full too the present of the British Art Matzhilen with consulted acrosses furtage the warmer of 1911. It consists of a many properties are to the present of the present in the arctical on a block of woods and hald upstight by four steel quisting. Account its top revives a large costs, ander of wood, covered with canves and uphostered on the funde. This case is intended to fit like a cap over the reset and uphostered on the funde.

Frest side of the envesope or the cursumthe device works as follows. The sirsing he knoted over the mast. A "tassel" of topes hearing out of the cone is pulled out, and the rope ands are strapped in dividently as a circle around the front end of the envesiops. The dirigible is then strong memory. The dirigible is then strong the mast, the cone is brought as line with it, and by pulling from the ground on a strong steel cable to whick all the shiple ropes of the "tas sel" are made fast, and which runs over a pulley drop in the space of the cone the front and of the anvelope is drawn firmly into the padded cone

In an exhaustive trial during a very reiny and scoreny night, it was proved that the atrahip thus moored and with the envelope kept stiff by a blower puping air from the ground through sixty feet of fluur-inch hose into the ballonet, swings with the wind as freely as a weatherwise while the come prevents any collision with the mast, if the wind becomes very 'Irregular.

#### The Lookout Mountain Road

ARMARKABLE piece of road build ARMARKABLE piece of road build Los Angeles, California on an automobile highway from Laurel Canyon to the sum mit of Lockout Mountain. It is just wide anough for one valided and has one route for the ascent and another for descending cars. It rivals the financia coafs of News airput of the same than the financia coafs of News airput of the same than the financia coafs of News airput of the financia coafs of the financia coafs

#### A Woodpecker's Storehouse

THE accompanying photograph shows in a realistic manner both the industrions and damaging habits of the emergetic California woodpecker (definerpute for selectorus beferdi). It is a section of a triegraph point that stool recently along one of the railroads near the Pacific Coast, which, as will be seen, has been fairly riddled and honeycombed on its four sides by thousands of holes pecked and bored out by the bird. Of course, these numerous cavities weekneed and destroyed the usefulness of the pole, which had to be cut down and replaced by a new one. The damaged telegraph pois is the reliant of the whole and considered the seen of the poles which had to be cut down and replaced by a new one. The damaged telegraph pois is the reliant of the whole and the poles which had to be cut down and replaced by a new one. The damaged telegraph pois is the reliant of the whole of the poles which had to be cut down and replaced by a fact that the poles which had to be cut down and replaced by the problem of food and a practical throwledge of the necessity of laying something by for a rainy tag. When submitted the problem of food and a practical throwledge of the necessity of laying something by for a rainy tag. When submitted the problem of food and a practical throwledge of the necessity of laying something by the result of the woodpocker puls in , his spare moments liding fut, judgy accurs in nice if the cavities packed out by himself in jobic trees. If these are sarree in the participar region of his hallitat a firight telegraph pole is coundedwid ideas for a safe in the problem of the country of the problem of the participar region of his hallitat a firigh telegraph pole is coundedwid ideas for a safe in the safe and the problem of the participar region of his hallitat a firigh telegraph.

ratio as terrains the reach of certain piles and bereath of the reach of certain piles and bereath of the both and animal

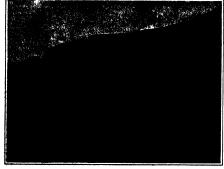


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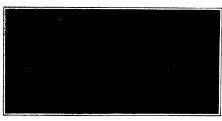


Woodpecker's store-

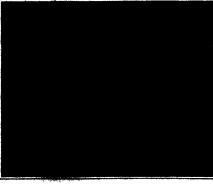
Pigeon scout photo graphic station



The one-way road up Lookout Mountain, California.



Laundry car for the Russian army



Landry machinery instilled in the cur.

world such as the Jays magples and squirrels To be on the guard against these robbers the bird bores a deep cavity sufficient to take in his whole body and there he stations himself to guard against any approaching marauders and treepassers in consequence there are numerous battles and the ordinarily well disposed and peaceful woodpecker among its kind becomes a vigorous fighter and all intruders are stateded and driven away in a hurry During the spring and summer the food supply of the wood pecker consists of fruits berries and to a great extent of various insects From its destruction of the young larva and many insect peats the bird is looked up on as of considerable economic valus in the community

#### Pigeon Scout Stations

EXPERIMENTS have been made in securing purposes. The higheons are provided with miniature cameras furnished with abutters that are released auto matically. The birds are set free from such points that they are liable to By over the enemy's fortifications. When the enemy's fortifications when a few elements of everyopenic on the enemy is a few elements of the enemy in t

#### Laundry Car for the Imperial Russian Troops

ALAUNDRY car has reently been in Railways for the use of the Imperial troops. It was built at the Hanover Wagou Wolk Ginover Lindin diermany The car has a width of 9 feet 10½ inches and a height outden at center from rail level of 11 feet 11 inches and its built according to the Hussian standard 5-foot gage. The equipment linitudes steam boilt er on deathing machine which make the properties of the provided which should do much toward improvided which should do much toward improvided should so much toward in the provided which should do much toward the provided which the p

## A Wind Wagon for the Sahara

LIFT LATARGE E commanding the just made a report to the Algerian headquarters relating to some experiments with a new method of traction which may prove every useful in crossing the desert. The apparatus consists of a sled which is driven by a propelir and a 50 horse power a respiane in or 1 lib details of the apparatus are not given but it is said that it will earry three persons and can castly circulate upon the sand dune at a speed of 20 miles an hour or even more. It is the invention of capt (r as and was designed in the first place to convey actiphanes in the desert across the sand dune and transport of capt (r as and was designed in the first place to convey actiphanes in the desert across the sand dune rection of Grand 1 rg which it was lathered in the propose of the place to convey actiphanes in the desert across the sand dune rection of Grand 1 rg which it was lathered to the propose of the place to the propose of the place to the place of the transport in the desert across the stand dus regions in the followed by others in October. In first trials were made in July and will its followed by others in October. In the officers propose to fit planes upon the sled so that it will act partly on the principle of the acroppiane.

## Inventions New and Interesting

Simple Patent Law; Patent Office News: Notes on Trademarks

#### Ear Protector for Gunners

N the Scientific American of March tor used by men on our battleships and by the United States Coast Artillery companies to prevent injury to the inner ear to concussion caused by the discharge of s. The inventor of that device ently improved it considerably, as shown in the accompanying illustration shown in our previous issue was in the form of an anchor with a bulb at the end



which fitted into the car passage. The disadvantage of the device lay in the the device lay in the device lay in the fact that it was not very comfortable in the ear, as it afforded poor ventilation and was too apt to be misplaced accidentally. For this reason the present device was invented. It consists of a tube of celluloid bearing consists of a tube of celluloid bearing two thin washers or diaphragms of rub-ber or leather. The bore through the celluloid tube has ports between the washers and terminates in a passage running at right angles to the bore at the inner end of the device. In this way there



Enlarged view of the protector.

is thorough ventilation of the ear, so that the device may be worn with com-It must be understood that the de vice is not a plug, but in a true sense of the word a protector. The small bore in the celiuloid place will not carry the heavy vibration due to the concussion movement of the air, but will admit ordinary sound waves, so that it is pos-sible to converse and hear conversation very plainly with the protector in the ear. The passage through the protector is so disposed as to prevent the concentration of the sound waves by the pinna of the ness, and "ringing cars," but will shut out wind, dust or water from the ear

#### Pneumatic Clutch for Automobiles

A N inventor, living at Los Angeles, Cai., recently devised a pneumatic clutch for acropiane engines. The clutch was experimentally fitted to an automowas experimentary intend to an automobile, and on a test run to Santlago it gave such excellent results that it was decided to manufacture this form of clutch for automobiles. On this test run an air pressure of less than one pound was employed in the clutch, and its ease of contact and quick release were very satisfactory.

lows: By means of small ports tapped into the cylinder at the bottom of the stroke a pressure of about two pounds could easily be obtained under lowest throttle. This exhaust gas was led through a small pipe to a check valve and then to a three-way valve A, Fig. 8, operated in this instance by a foot pedal B, and connected in the conventional manuer to the emergency brake. The three way valve transmitted the pressure to the clutch on retracting the pedal and released the clutch when the pedal was pushed down. The pipe line leading from the valve A entered a small tank C. which d as a reservoir to take up the pulsations from the crimder, thence the pipe line continued to the clutch, entering it at the point D. Fig. 2 shows the clutch line contained.

So after an, and the point D. Fig. 2 shows the clutch partly broken away to reveal the interior to those ploneers in the oil fields of Ohio details. The exhaust gases under pressible and Fennsylvania who have done so much sure were led to a ring E, which was stationary upon the clutch sheer F, and For without petroleum we would not passing through a channel in this ring have the automobile, the aeroplane, or the motor box; at least it is safe to say that we would not have reached a point.

So atter an, and the partly and Fennsylvania who have done so much promotion the proposition. movable cone-shaped members (i. These cone-shaped members were mounted back to back and coupled together with pins to back and coupled together with pins automobile, and the motor boat have H which, owing to their siding engage-be ment with one of the members, allowed advent of the internal-combustion motor. the members to move apart. The members G were also connected at their peripheries like a believs by means of two leather bands I, as shown to best advan-tage in Fig. 1. The cone faces of the members II were coated with granulated compressed cork, so as to provide better gripping surfaces. The air pressure introduced between the members G cau them to spread apart, and engage the outer member K of the clutch. The pressure of a fraction of an ounce would bring the friction surfaces into contact, after which a steadily increasing pressure would develop until the car was started. The transmission of from one to one hun-dred horse-power as the pressure increased was readily accomplished. The was connected to the gearchange shaft, and owing to the easy en-kagement and quick release of the gears it could easily be shifted when not under strain without attention to the foot pedal.

## The Diesel Patent

By Mayner H. Gordon, United State Patent Office

THE twentieth century may well be called the oil age. If one but stands for a minute upon a street corner of any of our large cities, and notices the num ber of automobiles passing, and considers the increasing number of vehtcles of the air, or goes to the river bank and watches the countless motor boats rush-ing to and fro, he realizes how depending to and fro, he realizes how depend-ont humanity is upon petroleum. And when we stop to consider for a minute how very young the art of self-propul-sion is and what rapid strides it has made in the last few years, we cannot help but feel that the coming years will have before the world metals which bring before the world a period which should be designated in the life of our planet as the oil age.

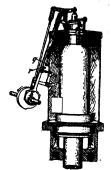
with other inventions, the aeropiane, the We have now reached the time in the development of the internal-combustion engine at which we appear to be about to take a stride forward. Within the to take a stride forward. Within the last few years a new type of motor has been pushing its way to the front. This is the Diesel engine, an engine whose wonderful popularity is due chiefly to three points. The first of these is the fact that it runs on crude oil or petrole tency of 0.38 pound of fuel per brake horse-power an hour. second is that it may be very reliably de signed in large units, engines of this power having been constructed as high as 12,000 horse-power. The third point lies

in its extreme simplicity.

Fublic interest appears to be all the more awakening in this wonderful engine, owing to the fact that the basic patent expired upon July 16th, 1912. The purpose of this article is an attempt to show something of what this patent contains, and to make clear to the project what will become of their proj upon its expiration.

The Diesel engine is prot

patents granted to Dr. Rudolph Die patents granted to Dr. Rudolph Diesel as follows: 1. No. 542,846. Method of an apparatus for converting heat into work, patented July 16th, 1895. 2. No. 608, 845. The internal-combustion engine, patented August 9th, 1898, reissued April 2d, 1901. S. No. 678,160. The method of igniting and regulating com-

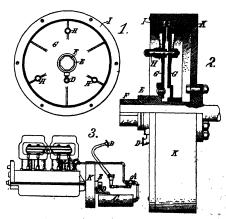


regulating mechanism original Diesel engine.

ustion engines, patented April 30th, 1901.

The Diesel process in brief is as fol-ows: Air is drawn into a cylinder by the downward stroke of a piston; the diston then moves upward, compressing the air into a very small clearance space at the top of the cylinder. The high compression used increases the temperature of the air to a point above the igniting point of the fuel used. Simultaneously with the downward stroke of the piston, the fuel is admitted in either solid or liquid form into the cylinder for a por-tion of the stroke. The fuel at once ignites, and combustion taking place, energy is developed in the resulting gas, which continues to expand during the re-mainder of the working stroke. The ex-haust stroke then takes place and the name stroke then takes place and the cycle is repeated. This process in brief is the process set forth by the patent issued to Diesel July 16th, 1866. It is interesting to note that either solid or interesting to note that either solid or liquid freu may be used. For solid fred an arrangement is made of a rotating raire containing a notice is a shown and the containing a notice is a notice is a shown and the containing a notice is containing a pocket, as shown and described in the application; for liquid fuel the use of an ordinary spray nossie is advocated. It is also stated in the application that liquid fuels may be profusely converted into vapor and introduced in this form. Perhaps the two mo important points set forth in this appli-cation is that the introduction of fuel cation is that the introduction of fuel takes place gradually in order that the pressure will not rise too abruptly; small also that preparatory compression of the air in a separate cylinder, before admission into the main cylinder, may be used together with an injection of water into the compressor if necessary, in order keep the temperature of the preparatory moderately low. It is further suggested moderatory low. It is further suggested in the application that the expansion or working stroke may be carried to a point at which the temperature of the exhaust gases are brought by expansion to a point below that of the atmosphere, thesely producing a gaseous medium which could be used for refrigerative purposes.

The speed-regulating steelensions of the



Prenmatic clutch for out

بليده اعتلياته وا of original district is shown in the ac-emporaries eigenvine. The construct B layer the rod corrying the steel side place it, insteaded thereto, up and down and in an evidence curve. The fuel administion valve at is opioned by the rod which carries a small steel block r. This speel block r engages for a certain portion of the circular traval with a steel piece q. The longth of the engagest travel is g. The langth of the engaged travel is descripted by the position of r, which is regulated by the linkage mechanism Si, which is connected with the governor. This means, therefore, determines the cut-off point for the fuel. The use of compressed air for starting the engine is suggested where are presented as the compressed air for starting the engine is suggested where are presented as the compressed are presented as the compressed are compressed as the compressed are compressed as the comp pressed air for starting the engine is sug-gested where supplementary air compre-sion is used; the air for this purpose be-ing stored in a reservoir. The use of a separate cylinder for the expansion of the exhaust products is suggested. The claims of the patent are as follows:

W 1848

- "I. The heart described process for con-verting the heat energy of fuel into work, constitute in fart compressing air, or a mix-ture of six and neutral gas or vapor, to a degree producing a supportant processing air, the compression of the compression of the com-taining against a restance or sufficiently to prevent an essential increase of temperature and pre-nard further expanding without transfer of best.
- and further expanding without transfer of the last in a internation-buston engine, the constitution with the cylinder and piston, of a valved succious inset for air or a mixture of air and neutral gas, a valved fuel feed constructed to gradually delears; the feel into the cylinder, and means in operative the control of the voticing stroke of the piston and for closing-the same at a predeferation of part of the stroke, substantially as described, the buston engine of the character specified, the combination of a combustion epided with means for gradually introducing Just Develo up to the point of cut-off, a compressor for air, a reserved of the control of the

The patent of August 9th, 1898, will apparently still give protection to the inwentor in a large majority of cases. This will be seen from claims 7 and 9 of this patent, which are as follows:

- patent, which are as follows:

  "I. In an internal-combestion engine, the combination with a cylinder and a piston constructed to compress air to a degree producing a temperature above the ignition-point of the freel, of a freel-freed, and a waive mechanism adapted to open the freel-freed somewhat in advance of the end of the compression in advance of the end of the compression in a part of the working stroke, substantially as and for the purpose specified.

  "3. In an internal-combustion engine, the combination of a cylinder and piston constructed and arranged to compress air to a degree producing a compression time and control and compression of the supply of freel by said valve, substantially as described."

  It still be noted that the two much
- It will be noted that the two main points set forth in these claims over the original patent are: first, an admission of fuel before the completion of the compression stroke, and secondly, a variation in the time of fuel admission as well as the duration of fuel admission. The other points of novelty occurring in this se patent are: the use of a burner or burners similar to the ordinary Bunsen burns for the introduction of fuel into the comzor use introduction of fuel into the com-bustion chamber, and an air, supply pipe from the air supply pipe of the cylinder in communication with the fuel supply. The relasure No. 11,909 of April 2d, 1901, sets forth in addition, to the points year above, the idea of a valve mechanism con-

sisting of a double set of came which may be shifted so as to allow the engine to be shifted so as to show the engine to run sin either the two-stroke cycle or the four-stroke cycle. Claim 10 of the reis-sne, which reads as follows, shows how broadly this device is covered:

byondity this nevers as "by the cylinder provided with cylinderston with the cylinder provided with the cylinders provided with the cylinderston with the cylinder provided with agins we as four-cycles cycle, and with means the rapplying comparesed all thinsts, of vitre property and consupressed during such consupressed during the cylinder to work the cylinder to w

The state of the s

The last patent of the series, that of April 30th, 1901, while not as important as the above mentioned patent, is interesting, in that it provides a novel arrange ment of ignition. Claim 1 of this paten appears to be practically self-explanation claim reads as follows:

"I. The method of regulating combustion in internal-combustion engines which consists in producing a mixtures of air or corpus control of the constant of the control of the constant control of the compression, substantially as described.

In view of the foregoing it will be noted that anyone constructing an engine noted that anyone constructing an engine of this type could use the Diesel prin-ciple only provided he employed a fuel admission which began on an upper dead center. The cut-off could of course be made variable. The most important point in this limitation arises from the fact that the feature of not being able to al before the piston has rea the top of the compression stroke. limits public use exclusively to a slow running engine. It is absolutely necessary to obtain an advanced fuel admission in a high speed Diesel engine, just as it is neces sary to use an advanced or early spark in the Otto cycle.

g It will be noted in sum

Diesel engine will after all only become public property to a somewhat limited degree. As in other cases, however, the very limitation set upon that which the public receives may perhaps arouse more stimulus than it otherwise would in the mind of the inventor and thereby, after all, work for the greater benefit and furtherance of the internal-combustion engine in the development of the oil age

#### Early Attempts to Protect Trade-marks By William L. Symons of the United

States Patent Office

THE first Federal law providing for the registration of trade-marks in the United States Patent Office was passed, as is well known, in 1870. Long prior to that date, however, attempts were made to protect trade-marks by depositing them

in the Patent Office.

The earliest effort was made under the design patent act of 1842. This law provided in part that anyone who had in-

vented
"any new and useful pattern, or print
picture, to be either worked into or worked on,
printed or painted or cast, or otherwise fixed
any article of manufacture"

might obtain a patent therefor. Under this provision of the act it was thought this provision of the act it was thought that a trade-mark could be patented, and thus an axclusive right to it be secured. The Patent Office agreed with this view, for it soon began to issue patents for "de-signs for trade-marks." These patented marks were applied, as stated in th trade-marks were applied, as stated in the application, to such goods as commonly bear trade-marks to-day, and consisted usually of the entire label piaced on the goods. Upton, in his "Law of Trade-marks," published in 1890, which was the first text on this subject written in the United States, condemned this practice of granting such patents, and very clearly showed that it was not the purpose of the design act to protect the mere name or ornamental device by which certain artisles of manufacture were known. His con

dusion was: "The policy of continuing such an unwarr able construction of the law is, to say the le His view of the law did not earry convic tion, and the practice was continued until 1870, when some two hundred of these 1870, when some two annowed or these patents for trade-marks had been sensed. Commissioner Fisher in that year stopped the practice, pointing out that the trademark law which had just been passed afforded ample protection to trade-marks, afforded ample protection to trade-mark and that it had only been by a forced on struction of the provisions of the desig law that trade-marks had been include within it.

In 1869, however, jurisdiction

larly conferred upon the Patent Office to accept the deposit of trade-marks by the citizens of Russis. The convention between that country and the United States proclaimed at that time prohibited the counterfeiting of the trade-marks of the counteresting of the respective countries, pro-vided for an action for damages in the courts of these countries, resulting from rongful use, and required the ma Russian subjects to be deposited in the United States Patent Office and of citizens of the United States to be deposited in the Department of Manufacture and Inland Department of Manufacture and Inland Commerce at St. Petersburg. Similar trea-ties were concluded with France and Belgium in 1869 by which citizens of those countries were enabled to deposit their trade-marks in our Patent Office

Under these treaties marks were also de-posited in our Patent Office by citizens of the United States. This practice was disapproved by the Commissioner of Patents in a ruling made in December, 1872, in which he held that these treaties and con-ventions did not confer authority for our Patent Office to accept the deposit of marks by our own people.

The desire of our citizens, therefore, to enter their trade-marks with the central government appears to have been strong at an early day, when a design patent in one instance and a convention to enable for-eigners to deposit their trade-marks here in another were seized upon as authority for filing trade-marks in the United State Patent Office.

#### Legal Notes

Sunday and Amendments.—In ex parte Miller Commissioner Moore has decided that where the year within which actio could be taken expires on Sunday, in or der to save the case from abandonn amendment should be filed on the pre ing day.

A Point in Interference Pro In Seacombe v. Burks, Assistant Commissioner Billings has held that the question of a party's right to make claims cor tion of a party's right to make claims of responding to the issue of an interference does not depend upon whether an amend-ment is subsequently made. The sole question to be considered is whether the specification and drawing of the application are sufficient to justify the all of the claims in question.

The Davey Patent Sustained .-- In Dave v. Cutter, 197 Fed. Rep., 178, the Davey patent, No. 890,968, for a process of treating and dressing a bruise or wound in a trunk or branch of a live tree was held valid trunk or oranged. In the patented process a cavity is formed in the tree by removing all decayed, unsound and foreign matter, and the walls of the cavity are then coated with molten tar and before the tar hardens the cavity is filled with comentitious ma terial which will adhere to the tar.

A Suit Thirty-six Years Old,--- A suit is now before the Supreme Court and will probably be heard in October, which was begun in or about May 17th, 1876, in the Circuit Court of the United States for the Southern District of New York. The suinvolved title to a number of Edison pat The suit ents and the parties to the original bill were George Harrington, described as of Washington, D. C., and Thomas A. Edison plaintiffs, and the Atlantic & Pacific Telegraph Company and Jay Gould, defend graph Company and May Yound, decon-ants. Testimony was taken in New York and London during 1879 and 1880, and in 1885 Thomas A. Edison, as surviving plain-tiff, filed a petition in the case asking for a decree of revivor as against the executor and trustees of Jay Gould. Following the answer by the executor and trustees conanswer by the executor and trustees con-siderable testimony was taken and the case was heard. After various proceedings, appeals have been filed to the Supreme. Court and the hearing soon to be had will be upon motions asking the dismissal of the appeals on the ground that the Court is without jurisdiction to peas upon questions sought to be raised. The prominence of the parties and the length of time con-stance of the contract of the con-tinued in the litigation give it a special interest.

#### Notes for Inventors

Ship-coaling Apparatus .-- The apparatus shown in the patent to Michael S. Iverson of New York city shows a conveyer which is pivotally suspended at one end below a ahip's deck so the conveyer can swing horizontally under the deck, a traveler supporting the swinging end of the convever so it can be adjusted under the deck veyer so it can be adjusted under the deek and means being provided for adjusting the track for said carriage. The patent is No. 1,038,588.

A Conveyer with a Side Guard. gravity conveyer patented by John Wil-liam Anderson, Jr., of Woodland, Ill., No. 1,038,514, has a bed consisting of a number of rollers side by side. Some, but not all, of the rollers are provided with means for preventing the lateral movement of the article conveyed, such means being shown as flanges on the ends of the alternate rollers and projecting across the space between the flanged rollers and the adjacent ones.

Hew About a Box Spring Improvement?

—If you have ever slept on a good box spring you know what luxury is. The s experience, however, h that the box spring does not endure. He has been unable to find a reputable maker who would guarantee such a spring for any wao wound guarantee suon a spring for any length of time. Ordinary bed springs last for years. The problem of a durable box spring should be solved by some one famil-iar with the subject.

Preserving Cotton Bolls.-Walter W Gayle, of Montgomery, Ala., has patented, No. 1,038,562, an unopened cotton boli No. 1,03,002, an unopened cotton coin ineased in a coating such as parafin, im-pervious to air and moisture so as to pre-serve the boll in its unopened state, so that the boll can be harvested green or un-opened and allowed to open subsequently opened and anowed to open subsequently out of the field. When so treated the boll is not subjected to deteriorating weather conditions nor to the collection of dirt, dry leaves and other foreign matters.

A Toy Eye Mask.—Herman Gruen-berger of New York city, in a patent, No. 1,037,473, shows a toy in the form of a mask consisting of a cup-shaped body of yielding material which can be sustained by itself between the brow and the cheek over the eye and has a central opening through which the pupil of the natural eye is exposed, the mask, when one is applied to each eye, changing the appearance the wearer to a remarkable extent.

Freak Amusement Automobile.—What is called a bucking automobile is covered in a patent, No. 1,039,035, to Charles E. Desenfants, of Chicago, as assignee of Edward W. Desenfants, and has front and rear axles with wheels on the ends of the axles and having their peripherica disposed eccentric to the axis of rotation, with the wheels on the front axles revoluble independently with respect to es that as the car moves over the ground it will be given an eccentric motion

A Novel Photographing Method.— Fletcher W. Battershall of Albany, N. Y., has patented, No. 1,037,192, a method of making photographs, in the practice of which a strip of film and means to separate the convolutions of the film but to exclude light are rolled together upon a spool and the film is exposed, and then with its separating means is rewound in a camera after which the roll is removed from the camera and developed in actinic light before unwinding it after it leaves the

A Continuous Powder Packer.--Tadeus Paraskovich of Vienna, Austria-Hungary, has secured a patent, No. 1,037,974, for an apparatus by which medicinal and other powders may be packed. The apparatus includes a suitable guide plate on which a continuous strip of paper is fed or advanced, a suitable quantity of powder is deposited on the strip at intervals, the free end of the on the strip at intervals, the free end of the strip is bent upon the powder, and after the strip has been severed to separate the powder-carrying part from the body of the strip, the side and end edges of the severed and folded paper are perforated to source the edges together and form a closed



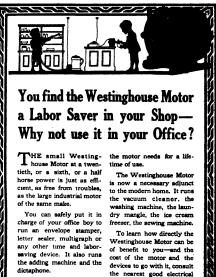
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PERCE POSTR.—It. L. HEART, 984 Losedate Bidg, Deluth, Minn. That is explicit has
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REQUIATOR FOR CHICKEN INCURATORN—G. H. Lee, 1115 Harney St., Omaka,
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provides means whereby
provides means whereby
the provides for charter is varied propertionate to the variation of host within the
incubating chamber; and provides for changing the relative radius of alternation of dry
heat and moisture in the said chamber.

heat and moisture in the said chamsher.

STALK PULLER.—C. B. SAFER, Perris.
Cal. The invention provides improvements that relate mainly to the gripping jews the sainty stalks, the links carrying these jaws and formed intended to the sainty of the sainty

Of General Interest,
BRUMH RACK BLANK.—F. BALLINGKI, care
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the State of the State of the State of the State
britistic in stocks, more especially stocks made
of cast or stamped aluminium, which has the
advantage over the method at present in use
that the bundles or tuffs of britistics need not
be gined, news, pressed or Januard linto socksis
or NON-REPLICABLE BOTTLES TRESPERS

or other holders.

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as a stopper for normally closing the bottle,
but permitting the free Sowing of Hquid
therefrom, and resisting any refilling of the
bottle.

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FASTENINO DEVICE—M. S. FULSE, care of A. L. Kelleg Greents, N. Y. The body of A. L. Kelleg Greents, N. Y. The body of A. L. Kelleg Greents, N. Y. The body of the cord to be fastened on first be passed around the projection and then back his the total the state of the cord to be fastened on first be passed around the projection and then back his the total the same of the control of

UND OUTDE FOR ENVENDENG. S. Howain, P. O. Der Die, Los Angeles, Cal. Title Savet-ton pertains to a deview to be said oi an excitobeon, lock-plate, or the like, and, act, his a guide for the key in antering she hypshal. An object is to provide a commercial she hypshal. An object is to provide a commercial she hypshal. An object is to provide a commercial she hypshall and the superconfigure he hypothesis with the same and the same a



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coupling is especially adapted for connecting the subpit pipe to the sube in such machines is diviting hummers, drills, reassers, clippers, and other machines utilisting compressed air se a motive failed, wherein anomals is provided for making a connection without the seces-sity of tools and without respiring shifted labor, which will obvise the danger of blow-out and the libe.

Westing and Lighting.

Heating and Lighting.
Heating APPARATINO AND VENTILATING APPABATUR—C. W. Boat as 18 foo. Ave., 46, 10c.
Angules, Cal. An object of the present invantum is to provide a device having the torus
may be used for hesting air which is subsequently discharged into the room containing
the grain, or which may be supplied to other
vanishing the control of the control of the control
ACEPTILAND LIAMP—J. M. Histories,
Casgville, IIII. The inventor provides a lamp
which may be easily takes apart to permit
of cleaning or repairing, which will be capable
unt of an exconnical use of cartie, while af
faceling a high degree of illuminating power.

Econoched Tulifsies.

6CREEN-THE CLOTH—I. F. Jackson,

519 E. New York St., Indianapolis, Ind. This
invasion provides a cloth for use on door
and wisdow screens or to cover openings of
buildings to beep out fifes, monquitoes and
other insects, the doth being relativeed in
process of nametheurs to render it accedingly strong and durable without duly indischain to the strong and durable without duly indischain to the strong and durable without duly indischain to the strong and durable without means to
the screen frame.

the screen frame.

CLOTIBS LINE SUPPORT.—M. River, 89

Wegman Place, Jersey City, N. J. This invaution comprises a compact stackment that
can be satily mounted upon the side of a house
adjacent a vindow thereot, and by means of
which the clothes line can be readily and
conveniently operated to enable the weah to
be hung out to be dried and taken in after
drying.

PROTOCORAPIC PRINTING MACHINE.
R. E. LOVING, Center, Shelby Co., Tex. This mackine is arranged to permit of accurately placing the negative (glass plate or fains) in fixed position to print from, and to allow accurate positioning of the printing paper and bringing the same in printing contact with the negative.

the seguitve.

WHEBE-RIM EQUALIZING AND TRUING
MACHING.—G. A. Heanes, care of Defance
Maching.—G. A. Heanes, care of Defance
Machine Works. Defance, Ohio. This inves-tion relates to woodworking machines, and
provides a machine more especially designed for reducing half rime or felles to derelair
shaps and accentably netting off the sads of
the half rime or felles to produce half rime
shaps and accentably netting off the solation
through the same of the same of the
point when placing the rime on the species.

PORTALIZ WHILL DORING NED DRILL-

ling shaft.

DEVELOPING APPARATUS.—S. Part, 85
Highland Arm, Oakhad, Cal. This apparatus
develops and wakes smaltined films in vets
a manner that they will at ne time be exposed
to the light. An object of the interestion is to
supply the developing apparatus with adjustments whereby it may be adapted to accommedate bins of different ideas.

angery tax development speciations with acquaridata films of direvent sizes.

CLUTCHE—II. B. Saviasis. Onder St. and
Schole Ave. Sponane, Wash. This improvement is in cirches in which an expansible
ring is arranged within a cylindrical rine and
adapted when expansible the finally engage and
to faston such expansible rings in a way that
the ring foom not take a friction held on the
tim at all points. Mr. Savage overcomes the
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ins at all points. Mr. Savage overcomes that
the ring foom not take a friction held on the
tim at all points. Mr. Savage overcomes that
the pint of powerful means by which the
ring engages the cim questly sit all points.

OII. PERDING IMPTCR.—C. F. RoovenLadden and the company of the city
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EVERAND TRANCOLD. The Savages of the interminal means. A fresher prepared with interminal means, of cell size is pointed to any
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EVERAND TRANCOLD. The Savages of the
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person by over 16,000 physicians gives accientific authority to the enthusiastic prasse it
has received from multitudes of grateful
men and women who date their return to
If you find yourrell with shattered,
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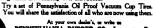
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PRED MECHANISM OF TURNING MILLS, LATERS, OR LIKE MACHINES—A. B. Ser-wers and H. TOMASON, care of States & Clerk, Coventry, England. This investion is princed-ity instead for use in turning mealines, and is particularly adapted to saft what are now known as bottag and turning mills, which are of the latte type particularly and the princed many particularly adapted to an evillary latte or similar mechanics having two directions of feed, the one at or about right angles to the other.

where, horing and facting machine, where horizon and facting works, defaute, older the six defects to wood-working machines and its object is supported by the six defaute and facing automobile wheels and similar wheels in such a manner that the boring and facing subscited), designed to be six defaute in the six defa

#### Bailways and Their Accessories

Saliways and Their Accessories.

RAIL—II COLLINS, Fairiave, Nonport,
R. I. The lavestion provides a fail stranged
to permit coversient removal of a wors out
rail had not its replacing by a new one with
of the rail on the ties and without requiring
tearing up of all the pavement flashing the
rail, thus aving considerable expense in rails
and time and labor in replacing worn out
baseds by now ones.

#### Pertaining to Recreation

TOY.—P. S. TILB, Butterfold, Minn. This invention provides a toy controlled to vary the path of travel thereof, the variation being a matter of skill, whereby the article is almed at a target; and provides for determining the path of an automobile toy to cause the same to implice upon, or gilde with, articles disposed in the path thereof.

posed in the path thereof.

MMANN FOIR INDICATING THE STRIKE
ING FORCE OF GOLF CLUBS OR SIMILAR
ING FORCE OF GOLF CLUBS OR SIMILAR
INFORTEMENTS.—8. O. H. COLINES and H.
V. PERENT, care of Marks & Ciert, London
produce an including device by Which as in
dication may be obtained not only of the force
of the blow, but also of its approximate direct
ness or the point of contact of the bell upon
the striking race of the club.

Pertaining to Vehicles.

BOOT HOLDER.—V. D. GILBERT, care of A. C. Haught. 20 W. Main St. Johnstown, N. Y. The object here is to provide an instrument of the control of th

easily applied and detached.

HORRE HITCHINO DEVICE.—Q. E. F.

JACK, The Rockland, Tremont. Deaver. This
invention provides a device for a horse, or
horses, operable by the vehicle when pulsed
lesses the pulling strain when the vehicle, is
moved rearward; provides locking means for
the wheels of a vehicle; and provides a harness attachment whereby the wheel of the
vehicle and the limited in its action to cert
extended to the limited in its action to cert
attached to the vehicle.

BUGOT OR WAGON GREAKER.—W. T.

BUGOT OR WAGON GREAKER.—W. T.

attached to the vehicle.

BUGGY OR WAGON GREASER—W. T. MARDOX, Alexandria, I.a. The invention has for its object the provision of a simple, lose-pensive, easily operated evice consisting of but few parts, capable of being stored in compact form, and wherein a variety of adjustments is possible.

DESIGN FOR A COMBINED RAZOR STROP AND MIRROR.—S. RISOR, 89 Varet St., Brooklyn, N. Y. This design is mainly of the usual shape, but the ring and and the bandle ead of the strop comprise original enter user vanual and both boding mirrors

Norz.—Copies of any of these patents will be furnished by the SCIENTIFIC American for ton cents each. Please state the name of the patentse, title of the invention, and date of this paper.

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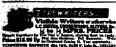
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Aviation at the Street. Reports and visited the field at Villnesship of 20 A. A. and yes gloved ground field by Colone Etrachauer, pursuings. spector of military across spector of military accessionies. N. 2811-lerand reviewed test require accessions and attitude and fire reserve enoughlise, containing the all seventy-two accessions. The specificance were all lined up on one side of this spheridated that the contract of the contract. After M. Rillerand had completed his review and made a congraturatory spech, the acceptance were started in groups of from a half-dozen to a score at one time. They presented as immunities. at one time. They presented an imposit spectacle as whole flooks of these is chanical birds arose and flow home sore country at high speed.

Commenting upon the results obtained at the French maneuvers, and, in fact, those obtained by all the sapestways held by the various powers recently, including England, army men are of the consensus of opinion that the aeroplane has but one of opinion that the akroplane has but one use, namely, its use in reconnoitering work as an aid to the cavairy. The idea that aeroplanes can be used for the pur-pose of fighting in the air, seems to be generally denied. According to a mem-orandum issued by the British War Office, the work of cavalry will undoubtedly be greatly aided by a well-trained aeronautical service, but except to a certain ex-tent in long distance reconncitering, air craft cannot in any way replace cavalry. The three uses of cavalry are given as (1) gaining information, (2) affording (1) gaining information. (2) affording protection, (3) action on the battlefield. It is only to the first of these uses that the aeroplane can properly be put. The three kinds of recouncisance of which the aeroplane is capable are classified as classified as classified as classified as the lows: strategical recommonsance, tactical reconnoisance, and the service of inter-communication. A modern aeroplane with a well-trained pilot can fly out a diswith a well-trained pilot can my out a dis-tance of 70 miles, reconnoiter the con-try thereabout, and return, within about four hours time, and be able to report the approximate strength, formation, and direction of movement of the enemy. But to a great extent on the time which has elapsed since the events occurred which are being reported, it is highly important to have the aeroplane equipped with wire-less and to be able to send back immedi-ately reports of what is found. This is also true in the case of tactical recon-noissance, which is reconnoissance at short distance, when the cavalry is with-in close touch of the enemy's cavalry and can no longer advance. And in the ser-vice of intercommunication, the wireless is again brought into play to supplement is again brought into play to supplement the field telegraph and telephone services that are now so widely used. In other words, in reconnoissance work it has been found advantageous to supplement the work of the cavalry on the ground by serial reconnoissance by means of air craft. France is the first country to work out the theory and practice of aerial reconnoissance. In the recent maneurecommonseance. In the recent manus-vers the aerial corps was thoroughly or-ganised and used as an aid to the cavalry. The nearly two-score machines in use were kept in operation so much of the time that in the two weeks of the manusa distance of 42,000 miles was covred in flight. In numerous insta aviators flew from 500 to 700 miles a day, during the maneuvers. The kind of machine to be use

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preferable; and finally, for practical reconnoissance, where the results must be immediately obtained, two-seated machines, either biplanes or monoplanes, are by all odds the best, as in such machines the pilot can be accompanied by an officer or a soldier who acts as an observer. It is preferable to have the observer a pilot as well, and to have the machine fitted with a duplicate control, so that in case of ac a duplicate control, so that in case or ac-cident to the pilot, his observer may fly the machine and bring it safely to earth. In actual warfare, where there is danger of being hit by bullets, this is all the more

One very important point with regard to the military use of aeroplanes is the fact that in bad weather they can not operate. Fog. snow, heavy rain, or violen wind make it impossible for the aeroplane scout to do his work, and in the recent scout to do his work, and in the recent German maneuvers, during two days out of five, no flying was possible. On the other hand, after waiting for suitable weather, a fast monoplane can cover as much territory in a few hours as would to thoroughly explore, and aerial scouting has the further advantage that reports can be instantly transmitted by wireless

### Money That Really Talks

THE question of protection against counterfeit banknotes is one which is ng discussed in England just at pres-A member of the Boyal Society recently showed the results of a discovery which he made, and by this means he is able to imitate copper or steel-engraved bank notes so perfectly that the pres of a large bank was unable to pick out the single genuine banknote out of a lot of ten which included nine of the kind reproduced by the author. This was in-tended to show the error of the prevailing opinion that banknotes cannot be imi-tated. At the same time that this somewhat disconcerting news comes out, a new remedy against counterfeit notes is proposed, this being the "speaking" banknote, and should a system of the kind be adopted, the note will not only concern the eye, but will assert its genuineness in a loud and intelligible voice, should it be a load and intelligible voice, should it be placed in a phonograph. In fact, the noice carries a given phrase which is inacribed on the edge just as on a phonograph cyl-inder, using a specially propared paper for this purpose. Any kind of phrase can naturally be used, and its purport is of little importance, as it is designed simply the have, a photo wor the quality of the to have a check upon the quality of the banknote by the use of the voice. All that is needed is to put the note into a prop is needed is to put the note into a proper-ity-designed phonograph, when it will speak for itself, according to the present idea, while a counterfeit remains silent. The method is certainly an original one, but it would not seem a very hard matter to counterfeit the phonograph record as well as the note itself.

#### Electrical Energy for Reclaiming a River Bank

In interesting contrast with the great hydro-electric generating transmission systems of which so much is heard nowa-days, including schemes to utilize the water power of the great rivers of the country, an electrically driven plant for mak ing a new river front at East St. Louis Ill., is now in operation. With this equip ment six million cubic yards of material ment ax million cubic yards of material are being dredged from the bed of the Mississippi River and deposited to trans-form a two-mile front of lowland, elevat-ing the land to a level well above the highwater mark of the river. It is purposed water mark of the river. It is purposed to complete this undertaking within the next two years. The dredge performing this engineering work, equipped with spe-cial machinery for loosening the silt of clai machinery for loosening the sitt of the river bottom and then ymming it back a considerable distance to the "fill" is supplied with energy ever a 2-min, 12,500-volt transmission thee, and has been in anonesmit operation single August 19th. The main pump is of 1,500-horse-jower and is espable of distressing shour 500 cubic partie of milit metacial (consti-nating 15 to 30 per const. of the total Suid Sections, but have been applied to the consti-



## A Knife Never Ends a Corn

Paring a corn takes off just the top ayer. Then it grows, and you pare Month after month one goes on put-tering with the same old corn. And there is always the risk of infection.

That finishes that corn. A new corn may come if you pinch the toe, but the old one is ended forever.

corn. In two days the corn comes out.

Sixty million corns have been ended in that way since Blue-jay was invented.

A in the picture is the soft B & B wax. It loosens the corn B protects the corn, stopping the pain at once. C wrape around the toe. It is narrowed to be comfortable, B is rubber adheafve to fastes the plaster on.

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4





The horizon of vision, the circle which bounds our sight, has not changed.

It is best observed at sea. Though the ships of today are larger than the ships of fifty years ago, you cannot see them until they come up over the edge of the world, fifteen or twenty miles away.

A generation agothe horizon of speech was very limited. When your grandfather was a young man, his voice could be heard on a still day for perhaps a mile. Even though he used a speaking trumpet, he could not be heard nearly so far as he could be seen.

Today all this has been changed. The telephone has vastly extended the horizon of speech.

Talking two thousand miles is an everyday occurrence. while in order to see this distance, you would need to mount your telescope on a platform approximately 560 miles high.

As a man is followed by his shadow, so is he followed by the horizon of telephone communication. When he travels across the continent his telephone horizon travels with him, and wherever he may be he is always at the center of a great circle of telephone neighbors.

What is true of one man is true of the whole public. In order to provide a telephone horizon for each member of the nation, the Bell System has been established.

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TEXT BOOK ON THE STRENGTH OF MATERIALS. By S. E. Slocum, B.E., Ph.D., and E. L. Hancock, M.S. New York: Ginn & Co., 1911. 8vo.; 372 pp.; illustrated. Price, \$3.

Grant & Co., 1911. Svo.; 372 pp.; illustrated. Price, 83.
In constructional work of all kinds a knowledge of the strength of materials is an important factor the strength of materials is an important factor has been taken of the opportunity advoided by taken now edition to correct the few leavished errors of the first, to amplify where necessary, simplify wherever possible, and to add noth practical knowledge and imsterdials and to add noth practical knowledge and imsterdials and to add noth practical knowledge and imsterdials and to did not practical knowledge and imsterdials and the debatron brief, according to the control of the control of

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(12060) J. F. writes: In two very interesting articles in recent issues of the Scrass-leading articles in recent issues of the Scrass-leading articles in recent issues of the Scrass-leading articles and very studied and interesting point and factions are also as a formation were laid before the laity. Cravity as I have leaded in physics is an unvarying force. I was taught, and from experiments I call in form, of equal bulk, were supposed with their centers in the same plane, both would reach the earth at the same time, regardings as to whether one was merely dropped and that other plane of the center. Evidently I have harbored a deduced the headed of a shell from a relation to the center. Evidently I have harbored a deduced them to the center of the same time, regarding as to whether one was many years, for in your second articles mentioned, the flight of a shell from a receive. Evidently I have harbored a deduced them to the tendence of the layer of a shell from a month of the center of the force of gravity, since the force of gravity since. The laws demonstrated in shyle since the superiment in physics of dropping one hall and shooting another horizontally. Both balls in the esperiment in physics of dropping one hall and shooting another horizontally. Both balls in th



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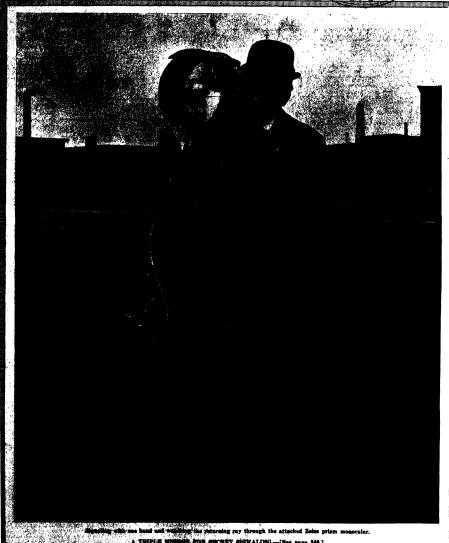
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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

NEW YORK, OCTOBER 26, 1912.

NEW YORK, OCTOBER 26, 1912.

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# SCIENTIFIC AMERICAN

#### NEW YORK, SATURDAY, OCTOBER 26, 1912

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles shart, and the facts outlentic, the contributions will receive special attention. Accepted articles will be paid for at

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Physical Safeguards in Railroad Travel

N three fatal disasters during the past few year causing the death of twenty-three passengers, the New Haven Railroad has proved the futility of attempting to protect the lives of its passengers against dangerous crossovers by giving instructions to its engi neers not to take the crossovers at a speed above fifteen miles an hour. The Bridgeport disaster, the second of its kind, led to a strong remonstrance and several mendations from the Interstate Commerce Com Nothing, however, was done to rem defects, and a little over a year later a similar disaster, due to similar causes, occurred at the Westport cross

In the investigation of this accident by the Interstate Commerce Commission the vice-president of the road was asked "What action, since the Bridgeport accident and the report that was made on it under the auspices of the Interstate Commerce Commission, has the New Haven road taken to prevent a recurrence?" answer was "We have done all we know how." commentary upon this reply, we invite attention to the article on the Westport wreck, and particularly to the diagrams and photographs which illustrate it, to be found elsewhere in this issue.

Perfectly natural was the oft-reiterated question of Perfectly natural was the off-reiterated question of the members of the Commission as to why the New Haven Railroad had not longthened its crossovers, or introduced some form of the automatic stop. The state-ment of the vice president that the lengthening of crossovers would not prevent such disasters is simply preposterous There is not a maintenance-of-way engineer on the whole 200,000 miles of railroad in this country, who would not wish to put in at express track crossovers the ensiest switch that the local conditions at the track and the ingenuity of the switch-maker permit—It is all very well for the New Haven officials to talk of "stiffening discipline;" but they very well, or it is their duty to know, that the safety of the traveling public demands, in addition to the stiffening discipline, that the tracks, the signal sys-tem and the rolling stock shall be made as proof against the errors of human failibility as the ample financial resources of the New Haven Railroad Company can

We look in vain for evidence that the company has made any effort to improve the physical conditions, even at those points which previous disasters had shown to be full of mennee - The public may well ask "Why, with the example of the Pennsylvania and New York Central roads before it, to say nothing of the recommendations of the Interstate Commerce Commission, has the New Haven road been guilty of such

#### The Nobel Prize Awarded to Dr. Carrel

T is with special gratification that we Americans note the award of the Nobel Prize for Medicine to note the award of the Nobel Prize for Medical Dr. Carrel of the Rockefeller Institute for Medical towarch. While Dr. Carrel is French by birth and towarch. While Dr. Carrel is wearches have been for itseaeren. Wille 197. Carrei is French in birth and training, his epoch-making researches have been for the most part conducted on American soil. There is no need, in speaking to our readers, to more than briefly mention the principal products of Dr. Car-

rel's genius. He won his spars in public recognition by his wonderful work in blood transfusion, of which an account has already been given to our readers in one of our August issues of inst year. In 1909 be entered the Rockefeller Impitute for Medical Research and began his investigations on the continuance of theme life in excised portions of the animal body. These are of the highest interest, both from the point of view of e science and also in their application to medical

and surgical practice.

From the standpoint of theory it may well be said that our ability to cause the growth of living matter in other brings us perhaps one step nearer to that dream of the biologist ream of the biologist—the production of living matter which was so ably commented upon by Prof. Schäfer in his recent address. From the practical point of view several important reflections present themselves. Dr. Carrel has found that the medium which in normal pr. carre ms found that he meanum which is normal life surrounds each tissue, is not the one best adapted for its growth. This implies on the one hand the possi-bility of perhaps stimulating the growth of certain organs or tissues, as the need may arise, by medication with specific substances affecting that particular tissue. It suggests, on the other hand, the possible cases. It suggests, on the other man, the possible opposite procedure of checking the growth of abnormal structures, such as tumor and cancers, by similar medication. It will be remembered that efforts in this direcwere made some years ago by Prof. Beard of

Edinburgh, unfortunately without any apparent success. But what appears undoubtedly at present the most promising field of application of the results obtained by Dr. Carrel is the grafting of foreign healthy tissue in place of diseased or injured tissue. In order to be able to practise such transplantation as a matter of regular routine, and not as a mere occasional medical curiosity, it will be necessary to have on hand and prefor use suitable portions of living tissues. possibility of keeping alive for several months portions of excised animal organs placed in a suitable nutrient medium, as demonstrated by Dr. Carrel, is from this point of view of the highest interest. And the import ance of this line of work is proved beyond peradven ture by the successes recorded by Dr. Carrel in the nctual transplantation of entire organs, such as the kidney, in animals. The new organ thus engrafted has en found capable of fulfilling in every way the func

tions of the normal and natural organ.

The Nobel Prize is intended at an a ward for achievements of no ordinary merit. So long as there are men like 1r. Carrel for candidates we need entertain no fear that the prize should ever lose any of the prestige

which so justly attaches to it.

Farm Economics HERE are many reasons why the subject of Farm Economics should command special interest. In the first place it concerns directly and personally a large and important class of ou population. Then, again, indirectly we are all depend population. Inefi, again, indirectly we are an observe-ent upon the farmer for the most indispensable of all our supplies—our food. To the student of political economy the special branch of agrarian economics pre-sents some features of particular interest owing to its fundamental character and its close relation to the most primitive wants of man.

Government is doing splendid work in collecting data which must be welcomed by each of these classes of persons interested, but most of all by the farmer to whom the question of the judicious distribution of his investment, to the best effect, among th several items incidental to farm management, is a

matter of dollars and cents.

Bulletin No. 212 of the Bureau of Plant Industry. "A Study of Farm Equipment in Ohio," gives a most valuable review of important data of this character gathered and collated with much painstaking care by

On twenty-one farms investigated the following was on twenty-one rarms investigated the rollowing was found to be the average distribution of capital invested: In land, drainage and water supply, 61 per cent; in buildings, 21 per cent; in implements and machinery, 5 per cent; and in live stock, 13 per cent. The bulletin gives much detailed information, of which figures just quoted represent a gross summary.

Ours is the day of scientific management. No long-er need the farmer slowly find his way to the best working conditions by a series of successive approxiworking conditions by a series of successive approxi-mations—the Government helps him to profit by the experience of others, who have preceded him, and have paid the heavy dues of that excellent but dear school-

#### The Problem of Launching the Naval Hydro-seroplan

HE development of the hydro-aeroplane seemed at the very beginning of its dual application to at the very beginning of its dual application promise speedy acceptance by the navy military adjunct for the purpose of scouting, partisans of this modified aircraft lost no time in m

ing all sorts of extravagent chiese for it. As to them, the fast was to have new eyes it. One cost, and the victor was to the productor with extract was to the productor with many of helping the fiest communious to gradual muturies while kinself tathing adventage or opening presented by an marries managery. But of the contract of th art of the enemy.

part of the enemy.

There are some physical conditions which, unfortunately, make the practical acceptance of the sarophane on shipboard hard to realize. The notable lights of Bly from the U. S. S. "Bircaingham" two jears and the later performance of the same eviator is dying to the U. S. S. "Pennylvania" and returning from that ship, showed what could be done under favoring conditions; and they also proved that the aeropiane was quite unfitted for associate operations with a craft at sea especially if the flying machine was forced to take to the water. The extremely cumbersome launchtake to the water. The extremely cumbersome latura-ing and landing platforms, well seough for an experi-ment, could not be tolerated on a fighting ship in the of war. The logical outcome was the hydro-sero-piane. The very fruity of the dying machine marked it an easy pay for rough waters; and while its pon-toous might serve to add an element of safety for the benefit of the aviator, still they could promise but little and the safety of the safety of the safety for the beened or the visitor, still they could promise but little protection for the planes and general structure if ex-posed to waves of any force and weight. This has been discouragingly exemplified upon many consistons up to date. It was evident that even the water-picture was no better than the aeroplane, if it had to start from the water or return to that element when the surface was much agitated. Accepting, then, the pon-toons as features of safety, the next logical effort was in the direction of finding an efficient means for get-

in the circums or maning an emceent means for ge-ting the aircraft away from the deck of the ship. The problem of successful launching has been given much thought, both here and in Europe. On the other side of the Atlantic the prox and come of the Wright sace of the Australe the provaint ones of the Wagat-launching rail have been discussed with more or less thoroughness, and among naval aviators it is generally looked upon as a possible last resort, but not the ideal demanded by the conditions affort and the requiredemanded by the conditions about and the require-ments of the latest types of high-speed machines. Shortness of runway is arbitrarily fixed in a measure by the essentially military features of the man-of-war, and for that reason some form of impulse had to be ed which would give the aircraft the ne ity of headway within a short distance. Capt. Washington I. Chambers, U. S. N., has been quietly working for months upon a launching apparatus which, in effect, is a sort of pneumatic catapuit. This mechan ceived its initial test at Annapolis during the past August, and while the aeroplane took a tumble. still the broad idea of the installation gave gratifying promise. It is quite probable that when the control of the impulse and its acceleration are properly adjusted, the apparatus will prove quite practicable within limits. However, it is not a question of throwing a solid mass into the air, but the far more delicate problem of get ting a sensitively balanced kite, as it were, started on its flight against the opposing air. napolis clearly showed how disturbing was the effect of a slanting wind and how necessary it probably would be to get the aeroplane launched squarely against the breeze. Even though the catapult be intalled so that it can be made to face the wind, that does not dispose of the difficulties. A big ship in motion very seriously modifies the streamlines, so to speak, of the air currents, and the higher the speed of the vessel the more profound the aerial perturbation. Only big ships will be able to carry associate aircraft, and here we have another aspect of the question to vex the experimenter. Only a short while ago, an Italian aviator was maneuvering in a hydro-neroplane over the waters of the Gulf of Spezia. By chance, the battleship "lante Alighieri" was running some of her trials at the same time. The "Dante Aligheri" is credited with a full speed of something over 24 knots an hour. Whether she was running at her highest rate then is not certain; but the aviator, swinging through the air across her wake, suddenly found his machine beyond his control, and down he plunged into the water. The mishap was unquestionably due to the disturbed condition of the air produced by the passing battleship.

Of course, there is a point forward on a ship under way where the air passing sternward probably flows fairly evenly, and the studies of the paval aviator fairly evenly, and the studies of the paval aviates must be twofoid first to evolve a satisfactory labyle-ing machine and then to piece that appearing whether and then to piece that appearing whether any do its over with the least risk to the aircraft. The public should not be hasty in its judgment or right in its conclusions. All of these difficulties will be skill-fully eventually a simple state of the state of the state of the skill of the in its conclusions. All or tress currentree was us such properties in time, but the hour for the secondaries on shipboard has not yet arrived. It must be customed that there are the corresponding difficulties of seturating to the ship arter a flight. Will this dying manchine he ship at make a nucessful kindling shaping all the ship arter at the corresponding shaping the work of the ship arter and the ship arter and the ship arter and the ship are the ship

#### Electricity

Sirest Lighting as Police Aid.—An Indiana city has secontly utilized a special street lighting system that had been installed for ornamental illumination to assist ned peen measured for ornamental illumination to assist the polies in case of an alarm after the lights have been turned off at night. A controlling switch in the office of the chief of police enables the lights to be fashed on while officers are socuring the streets.

The Smallest Dyname in the World.—An electric gen-rator only 15 millimeters in height, weighing only 7 minuses and wound with silk-insulated wire was reeatly exhibited before the French Academy of Sciences. The armature of this diminutive machine is 6.2 millimeters in diameter, and the commutator and brushes are constructed as accurately as in a large machine. The output is about 2 amperes at 2.5 volts

Despite is soot? ampress at 2.5 yours.

Photo-talography Without Selenium.—Paris daily newspapers are beginning to use pictures transmitted by a method employing a copper plate prepared from the original photograph negative. This transmitting plate resumbles a half-tone plate and consists of parallel lines. recentled a flat-come place and consists of paraset lines in gelatin upon the copper surface. In the black parts of the picture the lines are wide, covering nearly all the space, and in the whites they are very narrow. The plate is wound around the cylinder of a transmitting inatruat, synchronized with a receiving instrument which operates by the deflection of a beam of light.

Electrical Operation of a Bascule Bridge.—An elec-tric motor-operated bascule bridge of a railroad com-pany over the Calumet River, near Fouth Chicago, III., is supplied with power from an isolated plant with an equipment of storage batteries. The object of the equipment of storage batteries. The object of the auxiliary storage battery plant is to enable an electric generating plant of small capacity to be utilized without overloading of the generators or risk of failure in the operation of the bridge. The electrical control of the bridge is interlocked with the signal system of the railroad trackage passing over the bridge, so that it is impossible to receive any current on the controller until the proper signals have been set.

The Part of the Elected Market in Inspection.

The Part of the Electric Motor in Irrigation Work,— he irrigation of what used to be known as the Great American Descri has shown this strip of country to be very fertile land that had needed only adequate water supply, and the extension of irrigation has been part of dopment of several of the great electrical on systems in the arid zone. At the same time the more refined experience with irrigation has shown an important application of the electric motor, viz., for the pumping work necessary to make the newly provided important application of the electric motor, viz., for the pumping work necessary to make the newly provided water supply available to the farmer. The actual amount of water needed (under skillful farming) is small and may be brought to the farmer's very door by motors supplied with electrical energy at a favorable rate, viz., \$20 per horse-power for the six months' assaco.

Co-operation in Power Supply.-Nowadays the cooperation of public service companies not only helps out with the supply of many things which formerly all individuals and concerns had to provide for themselves, but gives a commodity of better quality than the small consumer could possibly afford otherwise. The electricity supply companies, especially, step in to give many private consumers far better light and to give many private consumers far obter ugit and power in both home and workshop than they could provide for themselves. This important feature of modern civilization is brought to mind in a recent number of a German electrical paper, pointing out the superiority of the electric motor over the gas or gasoline engine under certain conditions. Where the load is intermittent and relatively small and the ruling considerations are convenience, simplicity, and cleanli-ness, using the electric motor, that is, energy delivered assay, using the electric motor, that is, energy derivered by wire from a central generating station, is a cheap solution of the power problem. When power is required for long periods and in large amounts, however, there is a point beyond which the internal combustion engine will be cheaper than the motor.

The Vegue of the Steam Turbine in the Generation The Vegue of the Sisam Turbine in the Generation of Electricity—The large extransion to electrical supply equipment in Chicago that are now in hand call attention to the vegue of atean turbine generators in the huge projects at the present time superseding the engineering driven generators that were universally employed in the sartiest days of electrical engineering. For the Fish Street Satsion, Chicago, a Si, 500 editorast, 4,500 voil., Sphan Pursons' horizontal unit, having a speed of 750. Sphese Pursons' horizontal unit, having a speed of 750 revolutions per minute, is now under construction. This generator will be about 75 feet long and 18 feet wide. The addition to the plant will be large enough to house four of these units, bringing the ultimate capacity of this station up to 20,000 billowests. The project for the new Northwest Station in the name city comprises truth? now Northwest Station in the same city comprises twelve 20,000 billowest vertical steam turbine generators to be housed in two similar groups of buildings, and two of these units see now installed. The rotating member, containing at dishe with a total of 7,302 buckets and whighing simport exactly 100 tons, is supported on a step harder, which is supplied with all at a greature of 800 pounds pite squape face.

#### Aeronautica

Menoplanes Abandoned by the British Army.—Fol-lowing the example of the French, the British government has decided to use only biplanes for military pur-The many deaths that have occurred in the last few months is the obvious reason.

Test of a New Wireless Apparatus for Aeroplanes. A wireless apparatus recently designed for torpedo boats and submarines is being tested out in a Curtiss military biplane at Hammondsport, N. Y. The generator is said to weigh less than five pounds and to be driven by a source of power other than the aeroplane motor, so that it is not affected by accident to the On October 14th this machine was flying above Lake Kouka at night with a powerful searchlight, which would go out every time the aviator sent a mes-sage and would light up again as soon as he stopped sending

Two Airship Patents.-Frederick Brackett of Washray on Alfsanp Fatents.—Frederick Brackett of Wash-ington, D. C., has secured patents, Nos. 1,039,092 and 1,039,251, for airships, the former including a steering mechanism which has a frame alongside the craft and inclining downwardly toward one end of same with a number of planes spaced apart in the frame. The patent, No. 1,039,251, has a number of containers each formed of an elongated and pointed element substan-tially rectangular in cross section and curved longitudinally with the containers arranged side by side in d groups in such manner as to provide planes, suitable propelling means being provided.

Russian Military Aviation.—The Russian military remains entitled a variation concourse was opened on September 4th at the 8t. Petersburg aerodrome, and is the first one of any account to be held in the country. Eleven aeroplanes were entered, most of which, like the "Sikoraky," "Dux.", "Haeckel" and others, were of home make There were also two German flyers entered. The conditions we as follows: A continuous flight of 11/2 hours with a load of 400 pounds, and gasoline and oil for a 3-hour run. Six speed flights, forward and back in straight line, a 15-minute flight at 1,500 feet height, and a 10-minute flight with an extra heavy load. Also mounting and dismounting the apparatus, hard flights from plowed or grass-covered fields, and the like. The three prizes were \$16,000, \$8,000 and \$5,000.

Safety of the Hydro-aeroplane Again Demonstrated.— On October 11th, Marshall E. Reid, the young Phila-delphia aviator, and Lieut. Com. H. C. Mustin, of the deiphia symbor, and laude countries of the from Capo May over Delaware Bay to Philadelphia. The flight was made in Mr. Reid's Wright biplane which he has equipped with floats, lately. Some time after the start of the flight, while the men were 500 or 600 feet above the waters of Delaware Bay, a cylinder head blew off and the aeroplane dived to the surface of the bay. e unaccountable manner the gasoline caught fire. some unaccountance manner the gasoline caught fire, and the machine was ablaze when it struck the water. The occupants managed to put out the flames, but as the weather was foggy, there was nothing that could be done except to wait until they were located. They were eighteen hours upon the leaky pontoons before an oyster patrol boat picked up the men and their machine and landed them at Port Norris, N. J. After this adventure young Reid is highly in favor of the hydro aeroplane as he believes if the accident had happened above the ground both he and his companion would have been idled. It would be well to have some sort of a shrill signaling device on an aeroplane, that could be used in case of an accident like this in foggy weather.

Opening of the Aeronautical Society's New Field.— The new aviation field recently secured by the Aeronautical Society at Oakwood Heights, Staten Island, was auspiciously opened on Columbus Day by a model aeroplane contest and a number of exhibition flights by leading aviators. Three records were broken in the former events, and the finish of the program was a daring parachute jump from Harry Brown's biplane by Frederick Rodman Law, this b sixth time that this daring parachute dropper has per-formed this feat in mid-air. He carries the parachute folded upon his shoulders and attached to a sort of harness of heavy leather straps passing around his body and limbs. He made the leap from a height of 5,500 and was nearly ten minutes in descending to earth Mr. Brown, despite his injured wrist, handled his machi splendidly and there was no perceptible waver when Law jumped overboard. Mr. Law's sister, Miss Ruth Ban-croft Law, also made a pretty exhibition flight in her Wright biplans, and Mr. E. Weeks of Seranton, Pa. made an exhibition flight in a novel combined Curtiss and Farman biplane. Shooting at bunches of three or four toy balloons by Mr. Dillon Hoffman while circling our wey deallooks by Mr. Dillon Hoffman while oriening shout in Bregeri's nanchine was another feature of the exhibition. Mr. Brown was unable to operate his wights in a gusty wind so that Hoffman could hit the balloons, although the latter holds the record of hitting eightness sent of twenty balloons. Over 6,000 people attended the meet. The interest and enthusissem mani-fested graves miss. The interest and enthusissem manifested proved provided the meet.

#### Science

New Director of Dudley Observatory.-Benjamin Boss has been appointed to succeed his father, the late Dr. Lewis Boss, as director of the Dudley Obs tory. Mr. Boss was born in 1859. On graduating from Harvard University he joined his father in the On graduating work at the Dudley Observatory In 1906 he became Director of the United States Naval Academy Branch at Patula, Formosa, which position he held for three

Progress of Cremation in Europe.—There has been a marked increase in Europe in the use of cromation as a method of disposing of the dead. Last year there were 7,555 cremations in Germany as against 6,500 in 1910. 7,555 oremations in Germany as against 0,000 in 1010.
At present there are thirty crematories in Germany and almost as many in Italy. In England there were 1,033 cremations in 1911 as against 840 in 1910 Switzerland has pas sed a law which practically makes rment exceptional

Ageing Yellow Leather. Max de Nansouty says in Les Annales (Paris), "A specialist gives us the details of the following process for imparting to new yellow leather a look of age. It is first washed with plenty of water and a look of age. It is first washed with pienty or washed thoroughly dried; then the surface is coated with a layer of vaseline. When this layer has been absorbed this being kept up till by the leather another is applied, this being kept up till the leather is saturated. Only four applications at most are required to give the leather a very deep color. When dry it will be dull, but a polish may be imparted to it by any sort of encaustic

Artificial Cow's Milk.—A recent press dispatch states that three German chemists at Frankfort-on-the sovered a method of making milk synthetically in the chemical laboratory According to the dispatch several scientists, including Sir William Crookes, tasted and tested this milk and pronounced it palatable, is proposed to manufacture the milk in London and it at six cents a quart. The milk is made entirely from vegetable ingredients digested in a "mechanical stom-ach" Be that as it may, we hope that there is some Be that as it may, we hope that there is some truth in the report, for there could be no danger of tuberculosis or any other disease germs in the synthetic product.

Purification of Coal Gas. -- One of the most valuable rufficesion of Cols Cas.—One of the most various read or and original of the communications before the Eighth International Congress of Applied Chemistry was one by Dr. J. C. O'Neill. It relates to the continuous purification of coal gas with weak ammonia. The gas that leaves the condensers is washed with a weak liquor of ammonia, instead of with the gas liquor itself, found in the first scrubber Thereby the whole of the cyanogen is absorbed and also the greater part of the hydr sulphide. The temperature of the gas and the The temperature of the gas and the wash uld be above 30 deg. Cent The wash liquor bouor should be above 30 deg. Cent. the scrubber is returned to the ammonia still, and the impurities saturate the concentrated ammonia in the condenser of the still. Six months trial of the pro-cess showed that the oxide in the purifiers was insufficient to deal with the gas when the latter was washed with liquor in the ordinary way.

Death of a Prominent New York Chemist -On the eighth of this month the death was reported of Prof. Morris Loeb, who has for many years past figured prominently among the chemists of New York city. Dr. Loeb was formerly professor of chemistry at New York University, but had of recent years retired to conduct researches in his own private laboratory. His work dealt chiefly with certain phases of inorgana and physical chemistry. But his activities were not confined to the direct advancement of science alone. He will be specially remembered for his public serve and, among chemists, for the active part taken by and in rounding the hondists the and in raising a building fund for the headquarters of that club, com-pleted in 1911. He held the office of president in this organization in 1909 and 1912. At a special meeting of the Beard of Trusters of the Chemical Club (1914) n in 1909 and 1912. At a special meeting rd of Trustees of the Chemists' Club of New York city, held October 8th, the following resolutions offered by a committee consisting of Mr. Ellwood Hendrick, Mr. Clifford Richardson and Mr. Walter E. Rowley were adopted.

reas, Morris Loeb, the president of the club, has

Whereas, Morris Leen, the presument of the case, has been taken from us by death, and
Whereas, He was the leading spirit in bringing to fulfillment ambitions and plans that had long been ours.

Whereas, He was always ready to shoulder burdens

and to give help, and

Whereas, He was a man of order, and of integrity in mind and in heart, sincere in scholarship, hving with-out malice or scorn, speaking no cvil, and generous in

judgment, and

Whereas, We were drawn to him by ties of deep and

abiding affection, now, therefore, be it

Resolved, That we make this minute of our poignant greef at his passing, and that we cherish his mornovy as another of his great gifts to science and to hu-

# The "Immortality" of Tissues

### Its Bearing on the Study of Old Age

#### By Genevieve Grandcourt

AVERY evident disadvantage under which medical clearer has inhored has been the impossibility of watching the chemical process set in motion by substances introduced into the holy. For this reason various experimenters, from time to time, have attempted to "grow tie-sues" artificially, in such manner that their development, functions and decay—under both besility and diseased conditions—might be studied under the microscope. The only way in which this could be done would be to take a piece of living those from the body, and cause for cells to multiply, thesse being and up of

an aggregation of cells.

Science has failed to produce a single living cell, that is, a cell which will undergo the process of nuclear division (growth) which is the prime condition of its being, and it seemed equally impossible to cause a cell already living to undergo the same process if deprived of the circulation of the blood. Therefore, when in 1910 it was announced that Dr. Alexis Carrel with his assistant, Dr. M. T. Burrows, had succeeded, scientific credulity was taxed. A well known French savant expressed the opinion before the Society of Biology in Paris, that as others experimenting along these lines. had witnessed only degeneration and survival of cells, this phenomenon was all Carrel's discovery amounted to In view of past experience, indeed, the chances were in favor of a mistake. In 1907, Leo Loeb suid that he had produced this artificial growth both within and without the body. Obviously, such development within the organism where the process of utilizing the body-fluids, etc., follows the same course as in nature, takes on the character of grafting rather than of cultivating in a culture medium. As to enusing the ex-ternal growth, it was ten years later before it seems first to have succeeded. In 1907 Harrison, from Johns thopkins University, furnished details of his research in such form as to be convincing. But his work had reference to the growth of tissues only of cold-blooded animals, he having cultivated artificially, herve fibers from the central nervous system of the from .

Carrols work consisted in extending Harrison's methof to apply to warms-blooded antisis, Including, of course, mammale; he harding primarily in view at this time a more precise knowledge of the laws governing the restoration of tissues, for example, after serious surgical wounds. He and his assistant worked steadily to this end, and succeeded. The bissues of the higher antimals, including man, can now be developed in culture, and such development can be made to correspond to a rigidity precise technique. The feat is culture, and such development can be made to correspond to a rigidity precise technique. The feat is So complicated is this apparently simple matter in the application that only the most expulsive surgical skill is proof against incalculable modifications in re-

The plasmatic medium in which the growth takes place consists of blood which by a centrifugal process has been deprived of its cells. Generally speaking, it must be taken from the animal whose thouse is to be cultivated or from an animal of the same species, atthough chicken-these has been grown variously in the blood of human being, doe, and rabibit. The these

 Journal of Experimental Medicine, Volume XIII, No. 3, 1011, p. 388



Twenty-four hour old cancer growth (sarcoma) from piece of tissue extirpated from rat. The growth was from tissue the size of a millet seed.

is excised from the etherised subject under circumstance which are an absolute guaranter squared sectorial intection, tearing, chilling, drying, etc., and so lishe is tissue to be killed by exposure to the air, that it is safer to dissect it in serum. Both plasma and tissue may be kept in coid storage, although the time within which each can be preserved varies largely with the different species of animals. The plasma of the rat is useless in much less than a day, while that of the chicken can be kept over a week without congulating. The dependence of great results upon minute causes is shown by the fact that the tissue from which the growth is to take place must be exceedingly small; the reason letting because only the outer degree of the results of the great results upon the case of the contraction of the children of

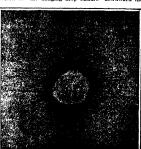


Dr. Alexis Carrel, who recently won the Nobel Prize.

tissue can get nourishment when deprived of the normal blood circulation. When the tissue is of any extent, all but the periphery dies.

In order to view the changes in form (morphology)

In order to view the changes in form (morphology) of the cells, mail quantities of tissue are grown by putting a tiny piece cut from the excised fragment on the inside of the cover of a glass-sidic, and overlaying it very thinly with the prepared plasma. When the cover is adjusted to the slide and sealed with partificial to keep the culture moist) it is quickly put into an electric incubator and taken into the observation-room to be deposited in the large incubator provided with a powerful microscope. The plasma congulating either when it receives the tissue or at once upon feeling the heat of the incubator, the tissues grow in what is described as "the hanging drop culture" downward into service as "the hanging drop culture" downward into



Connective tissue in permanent life. Demonstration that this particular tissue does not age in artificial growth.

the glass-slife. The growth can be observed after a intent period varying according to the nature of the tissus, the time elapsing since it has been deprived of circulation, etc. The inference per slows the direct division of the nuclei, and the growth taking the form either of layers or of so-called "radiating chaina," depending upon whether connective or epithelial tissue is being developed. In other words, the colle either spread far out into the medium or pack up, so to speak, in a dense many

as dense mass.
So far so good. But it is nocessary to study not only
the morphology, but the dynamics (movements) of the
estenditylication. For this latter purpose, a large
estenditylication. For this latter purpose, a large
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It now became evident that, under the right decumstances, the artificial growth of theses could be utilised in the study of many problems; such as malignant growth of tissue; certain problems in immusity, as, for example, the production of anti-bodies and antituxins of certain organisms; the reduningation of tissue; the regulation of the growth of the organism, or of different parts of the organism, relaveration and sensitiv; and the character of the internal secretions of the glands, such as the thyroid which plays a role of the glands, such as the thyroid which plays a role of the glands, such as the thyroid which plays a role of the glands, such as the thyroid which plays a role of the glands, such as the thyroid which plays a role of the glands, such as the glands of the properties. The stas overy short-lived. It was found that by passing the growth into a new medium, and repeating the process, the tissues would begin to grow again; but their life even under these circumstances was limited that the even under these circumstances was limited at the most to twenty days. This was manifestly too after a time in which to study the fundamental quesshort a time in which to study the fundamental queshort a time in which to study the fundamental queshort a time in which to study the fundamental queshort a time in which to study the fundamental queshort a time in which to study the fundamental queshort a time in which to study the fundamental queshort a time in which to study the fundamental which are the study of the standard of the study of the stasue to climinate waste products.

On January 17th, 1912, experiments were commenced to determine whether these effects could be overcome. The observations were on the heart and blood-ressels, artificially grown, of the clicken fetus; the tissue being taken from an embryo of seven and an embryo of elinkeen days. These growths were put into a salt solution (Rilagers) for a few minutes at different solution (Rilagers) for a few minutes at different matter medium. It was found that by following this method, the tissues could be made to live indefinitely; and the conclusions were drawn by the following very curious facts. When an animal is in the early stages of its development, the growth of its fitsues is necessarily greater than as it matures, there being steady (Constituted page 24.1).



Five-day cancer growth (sercoma) from piece of tissue extirpated from chicken. The growth was from tissue the size of a millet seed.

## Lesson of the Railroad Wreck at Westport

#### The Imminent Peril of the Short Crossover

On July 22d of last year the Scientific American, in commenting on the disastrons crossover wreck near Bridgeport on the New Haren lines, and it "it would be entirely possible to lay out the trucks with switches and curren so easy, that, if a heavy express train disabored its orders and swept over a crossover at a speed of sixty miles an hour, it could do so without any grave raiks of derailment."

The state of the s

Fourteen months passed away without the New Maves Railroad taking any steps to lengthen its crossovers, with the result that about the sunset hour of a September day, and at a point on the company's lines only a few miles distant from the scene of the Heidgeport wreck, that disaster was almost exactly duplicated. An express train, drawn by one of the beaviest engines on the division, dashed by the signals and swept at a speed of from fifty to sixty miles an hour ever one of these

death-trap crossovers, whose length, in this case, did not exceed 200 feet.

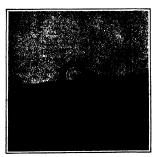
Had the New Haven
Railroad Company done its
duty, forn up these crossovers and rebuilt them according to the best modern engineering practice, as carried out on the New
York Central and the
Pennsylvania Lines, that
express train, even had it
beer running at sixty miles
an hour, would have
pensed through without derailment, and the ghastly
horrors which followed
would have been prevented.

In the investigation of the accident by the interstate Commerce Commission, at which the writer was present, the leading officials of the railroad took the most astounding statements must be characterized as some of the most astonding that ever came from the mouth of a responsible railroad official; for they can mean nothing close than that this company retues to do what if can in a physical way to render crossovers safe. In other words, the policy is to trust everything to the always railroad failible human element, and refuse to make those physical changes in the tracks, which would reduce the danger, due to disobedience or neglect, to a minimum.

We are fully satisfied that there is not a singleraliroad engineer—certainly not an engineer of maintenance of way—in the whole United States who would subscribe to the last statement of Vice-Fresident Horn. As a matter of fact, crossovers on express tracks can be made absolutely safe for the fastest stosed at which an engineer can null his train those of convolence and economy. The freight part for the handling of goods destined for or shipped from Westport and Sangatuck, lies on the north side of the tracks, and is entered from a siding whose switch distant about 750 feet to the westward of the station. For the accommodation of freight curs destined for Westport, three crossovers connect the two enathoused and the express westbound tracks with the siding and the yard. For a distance of about seven hundred feet to the west of the station the tracks are on a tangent. Then commences a curve to the left. Because of the super-elevation of the outer rails on these curves, it was impossible to place any of these crossovers on the curve, and consequently they were restricted to a distance of about seven hundred feet. To get them within the limited space available, it was necessary to use a soft crossover—in this case what is known as a num-

her ten In addition to serving the freight yard, these crossovers are used to transfer express trains from the local to the express tracks or efce errag, when the expresses have to make station stops, or have made them and wish to return to the express lines.

Now, in view of the fact that express trains on this line frequently run at speeds of seventy miles an hour or over, and in view of the fact that the human element as represented by the engineer is fallible and that the engineer, however good a man he may be, is liable to forgefulness, in o m ent a ry carelessness, or physical disability—due regard for the safety of the traveling public, should have led the company to place some of



The sharp curve to the right caused the engine to lurch askilly to the left. The action of the springs then threw the engine over to the right. In this position it cautred the second curve, which completed the overturning. Westport switch, looking west.



Not only was this crossover too abrupt to be placed on express tracks, but it was carclessly maintained. Note the sharp jog in the curve at the point indicated by the arrow.

Westport switch, looking east.

TATION

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The upper drawing shows how three crossovers were crowded into the 700 feet between the station and the curve to the left

The lower sketch shows the sharp curvature of the New Haven No. 10 crossover compared with the easy curvature of the Pennsylvania No. 20 crossover The overturning effect of the No. 10 is nearly four times greater

#### The right and the wrong way to lay out express track crossovers.

position, that, since they had made a standing order that this particular crossover was not to be taken at a speed of over fifteen miles an hour, the sole responibility for the wreck was to be placed upon the engineer of the train. Furthermore, they did not hesitate to assert to file Commission that they had done everything practicable in a physical way to prevent such an accident. The attitude of the New Haven road is shown by the following extract from the evidence, as printed in the daily grees;

"By Mr. Higgins (of the Commission): Would not the lengthening of crossovers at least materially decrease the element of danger? Answer (by Vice. President Horn): We feel that it would only be a question of time until men took the longer crossovers as much too fast as they take the shorter ones.

"Question: But would not the element of dailyet to decreased. Answer: I would state that in the end of the longer crossover would make the situation worse. It would be putting a presulum on violation of the rules." Again, the same witness is reported to have aid!: "We couldn't find that lengthening that crossower" (at Rridgeport) "would have helped the situation any." If the 'teo-president is correctly reported, these through them. Has this witness never heard of the Pennaylvania Railroad? Does he not know that on the main lines of that road crossovers have been built within the past few years with a special view to ellilianting risks due to disoludience of orders by entimetr? Does he not know that on that road there are crossovers which are so easy in curvature and of such great length, that the railroad has imposed no speed limit valuerer upon the engineers in running over

If the New Haven high officials, those who have to do with the appropriation of the necessary funds to carry out improvements suggested by its staff of engineers, are in ignorance of these facts or blind to their significance, the Ecustrica O-MERICAR invites their attention to the accompanying photographs and diagrams, abowing the existing dangerous conditions at Westport in contrast with the up-to-date methods of construction adopted on more than one of the first-class roads of this country.

It will be evident to any railroad engineer who studies the accompanying plan of the track layout at Westport, that the motives which led to the creation of and persistence in the present conditions there, are

these crossovers to the east of the station and others to the west of it, making them of such a length and with such easy switches and frogs, that in case the speed order was disobeyed the train would pass through without risk of derailment.

As a matter of fact, considerations of convenience, economy, or what not, led the company to crowd all three crossovers into the restricted space between the station and the point of curve (commencement of curve) seven hundred feet distant. Short cross-overs were put in and a standing order was made that they were to be taken at a speed not to exceed fif-teen miles per hour.

In this case, as in the accident at Bridgeout, forteen months before, the engineer swept through the crossover at a speed, as estimated in witnesses, of from fifty to stry miles an hour strange to say, the bure engine passed through intact; but in doing so the great centrifugal forces developed set up a rolling action which threw the engine entirely from the track. When it struck the first switch, the reaction of the harply-curved rail cussed the engine to lurch heavily to the left. Then, on the rebound, with a pendulum-

# A Triple Mirror for Secret Signaling

### Reflected Beam that is Invisible Out of the Path of the Beam

By C. H. Claudy

One of the most recent applications of pure mathematics and the science of optics to warfare is found in the triple mirror, in which the optical principle that "the angle of incidence is equal to the angle of reflection" has been utilized to make a device for secret signaling which is at once effective and portable. The success of the apparatus depends entirely on the discovery and manufacture of apparatus of sufficient accuracy to plane and polish glass into an exact right angle!

The triple infror, as the frontispiece shows, is, in appearance, merely a round brans case, which can be held in the hand, hung to a mast head, carried over the shoulder or swung from a saddle. Here it is mounted on a tripled. But the most costnal glance at it will reveal its peculiarity, which is that no natter in what position it is held, the observer can see in it his own face. He may look directly into it, or look at it from either side, or from above or below—yel always he seen his own face exactly as when directly facing an ordinary natiror.

The principle is that justially shown in the diagram. The infrort lose is a single prism of glasse (Fig. 1) the three sides of which are each at right angles to the other at the apex and the base of which is at a forty-five decree angle with the three faces of the pyramid. It may better be described as a corner cut off from a glasse cube it is difficult to show three sides in a two dimensional diagram without confusing the light rays, so but two faces are shown in Fig. 2. It illustrates, however, the fact that the emergent ray of light; and this holds true in the mirror itself, with the addition that the third reflecting surface permits this condition to obtain, no matter what the angle between light and surface of the mirror may that the angle between light and surface of the mirror may be mirror may be a first principal or the mirror may be determined as a first principal or the simple principal or the mirror may be supported by the mirror may be mirror may be supported by the mirror may be mirror may be supported by the mirror may be mirror may be supported by the mirror may be mirror may be supported by the mirror may be mirror may be supported by the mirror may be mirr

The mitror may be carried or hung anywhere. A beaut of light fectured on it from a distance may be visible to anyone at night, yet the return beam, which is parallel to the incident beam and continues with it, is not visible on the darkest night to anyone save the hosever who stands directly in its path. If now the mitror be capped and uncapped by the one signaling, those signals are perfectly visible to anyone in the path of the returning ray, but utterly invisible to anyone else.

A horseman scouling across country could be in the focus of such a beam of light and signal back again to those maniputating the light by capping and unapping bins mirror, and his signals be entirely invisible to any waterbing eye. And no matter how his horse gailuped, or what the angle of the mirror, the law of the angle of tendence and the angle of reflection would bring the reflected beam of light back again directly to its source. It is this feature of the apparatus which particularly recommends it for use on shipbard, where communication with sister ships or with the shore may be desired, in such a manner that no one may read the signals or oven know of their existence. Wireless signals may be caught and perhaps a code deciphered by any projectly tuned apparatus, wis wages and Ardols light signals can be read by anyone who can see them, but the return beam of light from a triple mirror is so small in area and so faint to the eye, except it be in a direct line with it; as to be absolutely secret.

at all times

So accurately are these mirrors made

So accurately are these mirrors made

are the final pollshings, that the variation

In parallel between the sending and receiving beam of light is less than one

foot in two miles. Moreover, the return-

ing beam of light is no larger than the

surface diameter of the opening in the mirror—perhaps six inches—so that an observer standing three feet from a signalman cannot read signals returned from the triple mirror at twe miles distance

In practice, the apparatus consists of a small portable sustrellight with a magnesia button, which is heated to a white heat with a compressed so<sub>3</sub>-acety-lene or oxy-hydrogen Jet This light is concentrated and reflected by a parabolic mirror. With this apparatus, a radius of nine niles can be had with propertus, a radius of nine niles can be had with propertusted by the niles of the control of the properture of the niles of the parabolic returns a "readable" beam eight een niles in length. At one side of the sending apparatus is a small telescope which is accurately in line with the focus of the parabolic reflector. Somewhere in the distance is a triple mirror; for the sake of illustration, let it be

hung at the mastheed of a battleship with the projection light apparatus in a fort on shore (Fig. 3). The beam of light is directed at the battleship. By the time it reaches three miles, it is so spread out and diffused—for it is not of great quantity—as to be

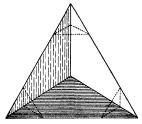


Fig. 1.—Shape of the triple mirror from the back. In use the pointed corners are cut off as indicated by the dotted lines.

completely lost to the eye not looking directly at the source. But come of the rays racks and implings on the triple mirror at the masthead. No matter how the ship may pitch and toes with the waves, the light ray comes absolutely straight back again to the station on shore; a man with his eye to the telescope sees through it a brilliant white speck only. As a sailor on the masthead caps and uncaps the triple mirror, the brilliant white speck appears and disapmirror, the brilliant white speck appears and disap-



Fig. 2.—Courses of the searchlight rays with mirror tipped and untipped.

pears to the eye of the observer at the telescope three feet to either side—and that bright speck is entirly invisible to any telescope or eye.

Now, it is conceivable that an enemy's hattleaship might cross between the two at the precise instant such signals were being sent, and that no observer on said battleship might be able to get to the exact point where he could perceive and read these stemals but and which, interrupted and allowed to proceed, would be sending in perfect allence and secrecy a message of dots and dashes which would not even have to be coded to be unreadable to the ensury.

of dots and dashes which would not even have to be coded to be unreadable to the ensury.

The apparatus is easily used in broad daylight, in which case, of course, the sending beam is quite invisible, yet so bright is the reflection from the triple mirror, as seen through the telescope, that there is no difficulty in reading its message up to three miles distance. This apparatus is more portable than most isand signaling devices, and being entirely independent of the ann, blefs fair to take its place among the portable signaling apparatus of all armies, as well as in Genmany, where the conception originated. A variation of a thousandth of an inch in the proper angle of the sides of the prisus would send the return beam far afield of course; nothing short of accuracy so absolute as to allow but a foot or so variation in several miles would serve, and that degree of accuracy was finally, with difficulty, secured.

An interesting application of the apparatus is its attachment to balloons and acroplanes, particularly the former. Carrying a searchlight of any power on a balloon is a basardons undertaking because of the possibility of the heat igniting the gasse from the survey. But the triple mirror can be used to receive and return a light ray from the ground with no liability of danger whatever, and night observations reported to the home station even in the onemy's country without such signaling being seen at all from any one beneath the balloon. With even the most powerful searchlight, it is difficult to locate a balloon a mile high, and the small power light needed to send forth a returnable beam is of no use whatever to an enemy in locating a high balloon.

In fact, in any case where a signal station is desired where even a portable light generator may not be carried, the triple mirror gives excellent results. It is, in reality, a portable, heatless and almost weightless source of light, depending for its power on another source of light at a great distance.

#### Bacteria for Destroying Locusts

A BACTERIAL epidemic has within two years freed tructan of the locust swarms which periodically invaded the country. The malacy lasts 12 to 46 hours and is characterized by a violent diarrhose, the contents of the bowels of the insects yielding a nearly pure microbe culture. The microbe has been inoisted by M. F. d'Hérelle, who in a memoir presentionisted to the French Academy of Sciences, examines its specifical pathological effects.

Now, M. d'Hérelle having been asked by the Argentine government to test the effects of the same unlerobe on another locuts species which every year devastates large portions of the Parana district, has reached surprisingly favorable results. As the virtulence of the unlerobe had been weatsened by a long series of laboratory cultures, it was at first reinforced by successive vaccinations on locusts. In the first series death was found to ensue after 36 to 60 hours, and in the tenta and following series after 6 to 8 hours. After isolatling the microbe in gelose from the bowel contents of the tweith seetles, M. d'Herstle transmitted these cul-

tures to broth which was used for infaction. After 24 hours most of the 300-odd locusts kept in a cage and fed with infected locern had died. After 5 days all the insects were dead, their bowel contents yielding a practically pure culture of the microbe.

Tests made on a large scale were quite as successful. One quart of culture liquid containing the microbe having been poured out on a field, a number of dead locusts

were found after 5 days throughout the area of about 90 acres, and the insecte continued to die on the following days, the epidemic even extending to the surroundings. The september even extending to the surroundings. The interved from the fact that a few days after the first infection it occurred at a distance of 30 kilometers (31 miles) from the center of infection, having doubtless been transmitted by the winaged locusts, which in Argentina are able in a single night to traverse a distance of \$2 kilometers (30 miles).

As other locust species are likewise susceptible to the spideshio, it may be hoped that this will size in other countries afford an effective weapon in the strugtion with the frauda accuracy.

The state of the s



Fig. 3.—Returning beam, invisible to anyone not immediately in the path of the ray. Tossing of a ship has no effect on the destination of the ray. It shways goes to the observer stationed at X.

it is highly improbable. As the circumference of a circle, the radius of which is three miles, is over cickiteen miles, and as, at that distance, the diameter of the returning light ray is less than one half of one second of arc, there is not a very large space in which to locate and stand one's self to see an unknown signal. If it is desired to have intercommunication equally

If it is desired to have intercommunication equals us scoret, the battleship would use its searchlight and the shore station its triple mirror. To the close observer, a ship and a station on shore would each be soon sending forth a motionless ray of light, with no storals passing. But in between and mixed up in these beams would be the smaller, weaker, but truly directed beam from the triple mirror, invisible to any save the eye which knew just where to look for them.

## Correspondence

and the second s

(The editors are not responsible for at-

#### The Quimby Accident and Gyroscopic Force To the Editor of the SCIENTIFIC AMERICAN:

In the Scientisto Assesscan of August 10th and elso-bere, Earls L. Ovington has tried to lay the cause of the Quimby secident to a tangled control wire, instead the Quinhey accident to a tangled control whre, instead of to the groscopic force of the Ganom motor. In presenting his evidence, however, he has conclusively proven to those who have studied the action of a gynoscope, the cancel reverse of his claim, namely, that the tangled control could not have been the cause and that the machine seted cancelly as this murderous and little understood force would make it act.

Let me quote:

"If you will essamine my sketch you will see that by
the wire catching as indicated, the rudder would be
thrown to the left as it plunged downward. Does it not carrow to the sate as it plunged downward. Does it not seem something more than mere coincidence that both Capt. Chase and myself agreed before we knew anything about this caught wire, that the aeroplane turned to the left as it fell ?"

Take a gyroscope top. Set it rotating and hold it in front of you with the axis parallel to your line of vision so that it revolves clockwise as you look at it, the same as a e motor when seen from the pilot's seat of a Blériot Turn it sharply to the left trying to keep the axis horizontal. Note that the forward end of the axis dives downward in spite of you. Tilt it quickly up and note it swerves to the left. Repeat these experiments many times and note that the quicker your turn the more

powerful the swerve.

Mr. Ovington admits the presence of gyrosco
in a revolving motor but asserts it is "negligible" the plane of rotation is not changed rapidly enough.

The Seguin brothers, builders of the Gnome, in an ex nt reported in Acre (American) of June 15th, 1912, have shown there is 57.8 pounds of gyroscopic force in a 50 horse-power Gnome in a 12-second turn when mounted on a pivoted platform and revolving at 1,200 revolutions on a proven pattern and revolving at 1,200 revolutions per minute. Mr. Thomas Preston Brooks, who first drew attention to the dangers of this force has proved that in a case of this kind the supporting platform receives approximately 80 per cent of the gyro strain. Therefore the Seguin figures represent about 20 per cent of the amount of force that would be present in the same engine if it were floating in air unsupported. However we will consider their figures as given. According to Albert Kapetyn (see English Flight, November 19th, 1910), and M. Bouchard Proceig of Society of Engineers of Paris (see La Nature of March 4th, 1911) the amount of this force increases as the square of the speed of the

If there is 57.6 pounds of gyroscopic force in a 12-scond turn there is 12 times as much or 691 pounds of it in a 1-second turn and 1,382 pounds in a half-second turn. Remember that a complete turn is not necessary but that a change in the path of flight of 1 degree at the speed of a complete turn in I second arouses the same force as a 360-degree turn, the speed being constant.

I quote again:
"As the tail of the machine went up and to the right. Willard was thrown out 25 or 35 feet as a hundred witnesses will testify.

Does anybody with common sense believe it took the tail of that machine 12 seconds to make a dive that would throw a man's body 25 or 30 feet? Is it not a practical certainty that it happened in fractions of a cond?

Ovington says it is not da Ovington mays it is not dangerous because the plane of rotation is not changed quickly enough. Certainly the turns are not quick enough, ninety-nine times out of a hundred. Nobody disputes that. But why (guore the hundredth time when the turn is quick enough and the force is too strong for the controls and another of our birdmen dives to his needless death? Ovington failed to understand the significance of the main features of the sections. In the first place a nun-

main features of the accident. In the first place a num-poor of eye witnesses, himself handeds, state positively that after Willard had been thrown out, Miss Quimby succeeded in righting the mandhes but only for an instant, when it was again whirled ness downward and dove in a straight like not the water. Now if the fould rudder cable caused the dive, as he clisters, how could she have righted the nachine? Then again with the rudder jeanment to the left how could the machine have sailed strength stems and avoided a sension of spirits? It does not senur just clear? Does 19?

seem just coner? Does 19?
If Mr. Overpaton is an engineer he should have par-ticularly solud several important points. He says Willard was thrown into the air 20 or 25 feet at though shock from a coshquit. He size eaps the dip was caused by the controls. Therefore, if he possesses the rudi-

ments of engineering knowledge he should know that the seropians would then turn about its center of gravity or lateral ards. As the passenger seat occupied by Willard was not more than 3 feet back of this axis, there could not possibly have been sufficient angular move-ment at this point to throw him out as described. I am confident that every competent engineer will bear me out in this statement

e conditions of the accident completely disprove Mr. Ovington's theo

On the other hand if, as I claim, the accident was caused by gyroscopic force in the motor, the entire machine would then turn about the center of effort of the motor which would be its exact cent Thus we see that the motor being the fluorum of the lever, Willard would be 7 or 8 feet from the center of effort and in a quick dive it would not be impossible to throw him the 35 feet. Suppose that a sight wind gust caused a sudden dip in the front of the machine. A very slight, quick movement would have been sufficient to have aroused the gyroscopic force. Miss Qumby would naturally attempt to correct the equilibrium by raising her elevator, thereby accelerating the precession gyroscope and causing it to twist the machine to the left and downward. The severity of the twisting motion would be entirely dependent upon the speed of the previous motion that aroused it and judging from the terrific force exhibited I should say this must have b an so quick that no human eye, one thousand feet below on the ground, could have detected it.

With this explanation it is easy to see how Willard could have been thrown that distance straight out from his seat, and, also, if one is familiar with the tremendous gyrating power of this force why the machine seemed to right itself.

Mr. Ovington went to great trouble to get affidavits eting his claim about the machine swerving to If he had read more carefully the articles of the several scientists who have warned against this peril, and particularly if he had ever studied the action of a one he would have known that under these condutions the machine always sucrees to the left as it falls.

Chicago, Ill.

RALPH M. PEARSON.

#### Wanted: Research on Gyroscopic Action

To the Editor of the SCIENTIFIC AMERICAN:

I notice that there has been some discussion in the Scientific American regarding the gyroscopic action of the rotating parts of flying machines. The Gnome of the rotating parts or nying machines. And officially the most popular engine that we have to-day. This engine is of considerable weight and practically the whole of it revolves at a high speed in the same direction as the screw or prope is no question about it, these high rotating parts do

is no question about it, these high rotating parts do produce a very powerful gyroscopic action. Some years ago there was a red hot discussion in England regarding the sinking of the torpedo-boat destroyer "Cobras." When I pointed out that there was no gyroscopic action, everyone imagined that I had "got my foot into it," as they said, but experiments showed that I was right after all.

am sending you inclosed a cutting from the Daily Mail, which I think will serve to show the effect of a

Gnome engine on a flying machine.

I am very strongly of the opinion that some experiments ought to be made to show the character and force of the strains that are set up when the machine is flying other than in a straight line. The experiments can be made at very little expense. All that is necessary would be to erect a rotating platform, rotating after the manner of a table latte, that is, on a vertical axis. The engine and propeller would be mounted on this platform, not rigidly, but on what might be called trunnions perpendicular to the vertical axis. The machine should be so mounted that it could move freely on these trunnions, say thirty degrees in either direc mons, say carry degrees in either direction. The trun-nions should be as near the center of gravity as possible and the machine held in a horizontal position by spiral springs. If now we cause the motor to run at full speed and rotate the platform on its vertical axis, we shall find that the n schine has a strong tendency to orisontal axis, and it would be a very move on the h easy matter with a spring balance to find out how much it would require to hold the machine in a horizontal position while it is being slowly rotated on its

If someone would make these experiments in the States and they should be published in the Scientific American it would be of great value to everyone who is interested in the development of flying machines.

London, England. HIRAM S. MAXIM

London, England. HIRAM S. MAXIM.

[The suggestion of Sir Hiram should be followed by one of the well-equipped technical laboratories of which we have so many in the United States. No one quescopic force is developed when an tions that gyros toom mas gyrescope force is cavanoped when an ascr-plane, drives by a single revolving-motor engine, makes a turn. The only question is as to the amount of this force. A gravileal demonstration along the lines sug-gested in this letter would provide cancit data.—Envron.]

#### Lack of Aviation Enthusiasm

To the Editor of the SCIENTIFIC AMERICAN. The undersigned wishes to make the following comments with reference to an editorial which appeared in the issue of September 21st of the SCIENTIFIC AMERICAN. The subject of this editorial was the lack of enthusiasm displayed in the United States in the progress of aviation, which showed itself glaringly in the failure of America to send a single machine across the line in defense of the send a single macrine across the line in defense of the Gordon Bennett Cup. In addition to the comments made by Mr. Charles A. Manley on September 28th, the undersigned wishes to offer the following suggestions. The strongest motive which urges on the French poo-

ple to perfect aviation to the highest degree attains pie to percest aviation to the highest degree attainable, regardless of cost, is their strategic relation toward Ger-many. To them the acroplane naturally appears as an excellent weapon with which to establish a superiority over Germany, and great hopes are set upon this mean of attack and defen This of course forces Germany of attack and detense. Ims of course forces Germany to follow suit and on its part to develop its aeronautic force to the highest possible degree. And the other European countries follow the example of France and Germany because they also have to reckon with the possibility of war, and the new weapon appears to them also as a very valuable means of carrying on warfare. Inasmuch as the United States are in the fortunate position of having no such powerful and hostile neighbors, but having on their borders only comparatively insignificant or else friendly nations, they have no occasion to pay the same attention to the new arm of war as is devoted to it by European nations.

In addition to the circumstances just referred to, there is another important fa ctor bearing on the situation, namely, that in spite of all the improvements of the aernamely, that in space of an one improvements of one aero-place of to-day, it nevertheless remains an unsafe mode of locomotion, and there seems to be no possibility of entirely overcoming this defect. Furthermore, the time of flight must necessarily always remain limited and can probably not be much extended beyond its present value.

The cause of these two defects must be traced to the necessity of using powerful motors and propellers. The consequence is that aeroplane flight has not become very general and has remained unpopular. In Europe, especially in France and Germany, the competitive efforts to improve aviation represent a kind of warfare, in which the lives lost are counted among the movitable cost of

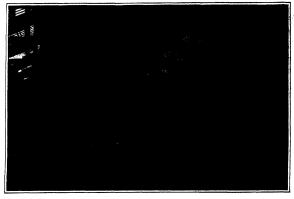
In a peaceful country, such as the United States, the causes which impel the European nations to competition in attaining the highest perfection in aviation are entirely lacking. If the military inducements did not exist in Europe, probably there would be even less progress there There is no lack of enthusiasm for the than in America. se here, but the only system of aviation which can find extended application and success in this country is one which guarantees greater safety for the life of enger and a longer duration of flight, a system which therefore, is better adapted for practical purposes and F. BIREDSTEIN.

Milwankee Wo.

There is a great deal of sound reason in Mr. Biber-At the same time we fear that he is a sin's comment little too lement to us as a nation in this matter. For the flights of the "Schwaben," representing, as they do, at least a semi-commercial undertaking, and the general interest which has been shown in them by the German people, prove clearly enough, that in Germany at any rest in aviation, however much it may be for tered by strategic consideration, has also a strong practical basis quite apart from its military raison d'être -

#### The Current Supplement

THE current issue of our Supplement contains a number of articles which will be found of special interest "Safety First" is the cry raised by R. C. Richards in dealing with the burning question of the Prevention of Railroad Accidents.-Mr R D. Andre discusses some very remarkable properties of aeroplanearranged in tandem.—The problem of internalcombustion locomotives is one which is likely to receive increasing attention in the future, and is briefly dealt with in this issue.—An excellent review of recent progress in illumination, representing the report of a special grees in illumination, representing the report of a special committee appointed by the Illuminating Engineering Society, should prove of interest not only to engineers but to the general reader also. Mr. C. A. Tupper di-sorthes a remarkable axity thousand horse-power blast furnace gas engine plant.—We had occasion some time ago to give a preliminary respect of Ser J. J. Thomson's ago to give a preliminary report of Sir 3 3 1 monison a new method of chemical analysis, in which the mole-cules are literally "weighed."—A most excellent detailed account of these experiments is now given by Mr. F. W. Aston of the Cavendish Laboratory, Cambridge, Eng-land.—The Fire Department of the French capital has land . recently been completely reorganized, the automobile equipment being brought up to the latest pattern. These innovations are described in a well-illustrated article.



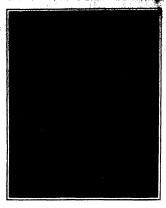


Fig. 1,-View of the Jambon-Bailly studio in Paris.

Fig. 2,-The "pallette," in which the hues are prepared.

## A Glimpse of a Scenic Painter's Studio

A Profession That Calls for an Intimate Acquaintance With Historic Conditions

By Dr. Alfred Gradenwitz

THE art of scene painting is one of the most interesting and at the same time exacting professions. It demands of its adepts, apart from their professional skill, a wast all-round education and knowledge of the most varied description A scenic painter ought, in fact, to be well acquainted with the history of styles, dress, furniture, armor, etc. all of which should appeal to him as strongly as architecture proper. He should have an accurate idea of the habits of any epoch and the customs of any nation. Among his records, in his own professional library, should be included the very principle of the various forms of architec-ture, sculpture, painting, etc. In the case of modern landscape he should not be at a loss to choose the right scenery and, if necessary, go abroad to find on the ground the inspiration required for his work. The real artist among scene painters, of course, always records his impressions in a sketch book which in course of time will form a real storehouse of valuable scen-ery elements. Visits to the foremost museums of the world as well as a keen observation of nature and men will be required to develop his taste and to form the material on which his imagination may draw at the right moment. In fact, the ideal scene painter has to comply with than most persons engaged in other walks of life.

the of the most difficult tasks, presious to the design of a given set of secuery, be to read intelligently the author's
nanuscript. Many will be inclined to
think that if a scene takes place in our
day there will be no need for such imagination, in order to point a Milago, a country road and cettage, a drawing room,
plain or fa-bloadabe, etc. This be trueenough if the pointer be content with
turning out such indifferent work as can
be seen in most second-class theaters. The
real artist, however, remembering that
seenery often is a decisive factor in the
success or failure of a pleve, will go
through the manuscript most carefully,
taking notes every now and then and
making the actors play in the secuery
tangined by binnesit. Many minor details entailed by the framatic action will
have to be thought out in this connection.

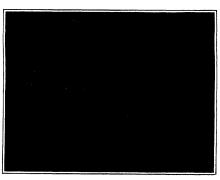


Fig. 3.—Studying the details of a scenic setting at the Jambon-Bailly studio.

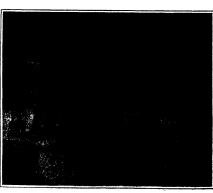


Fig. 4.—The draftsman or "tracer" marking the design upon a canvas.

ried out best in a studio like that shown in Fig. 1.

After reading the manuscript, the scene painter first draws a rough sketch, fixing the "principles" of the scenery, with the pencil, pen, carbon, or crayon, but pro ably with water colors and brush, thus allowing his imagination a wider scope. Much skill is required to produce even this first sketch, so that the painter may effectually defend his plans in discussion with the director and the author, both of looking at the matter. This sketch. which often is completed in an hour or so, will be used in producing a small sized model or "maquette," a miniature stage— similar to those put together by children with cut-out paper and wood-which is so designed as to give an adequate idea of the scenery to be produced. Any de-tails are shown in the form of small pieces of cardboard cut out and fixed on a horizontal cardboard reproducing the floor of the stage. This is how any trees, houses, rocks, in fact, the whole of the scenery, are reproduced in a diminutive compass, inside a box opened in front and on the top, so as to insure adequate light-ing effects (Fig. 8).

On this miniature stage the artist arranges his scenery. Here he see on a reduced scale where the various parts of his work should be placed. He is in a position adequately to judge of effects, adding and cutting down, and altering any inconvenient arrangement. A "macusatiful earlist's personal work. Its amount of the artist's personal work. Its macossful dealing reveals the capacities of its author, and a poor "maquette" often forestells failure of the whole scenery. A good stage model of this kind, which may be a master-piece in itself, is most useful in arranging with the author and director any minor alterations that the case may require: the scales generally chosen are 3, 4, and sometimes 5 in 100. It is a welcome meetins for the patient to test his light effects, to ascertain the height of the ceilings and to check the prespective. In order to prevent any disagreement between the dimensions of the scenery and those of the actors, the foreground should slways be putted in real dimensions.

About a hundred years ago the general practice was to trace the outlines of a

forms on the ground, but to complete it founding mp, in the position it was to study on the stage. Extensive walls as well as a complicated system of scarfoiding therefore were required to paint

While this practice is still followed in England and in some studies in this country, painting on the ground, a much more rapid process, has been found preferable nearly everywhere else.

In order, however, to enable the painter to work easily and without much bending over the canvas lying on the ground, all sorts of utensils fitted to the ends of long sticks are used. These utensils are the "brooms" and "brushes," the "ruler" and the carbon-holder.

The "brooms" are merely hig painting brunkes, round or square, such as those brunkes, round or square, such as those used by decorators, and are handled in an unright position. They serve §6 apply to the canvas the first general layers and are handled alternately from right to left, and left to right, with the two hands placed above each other, by long sticks kept vertically to the ground, so as to allow the paint to be laid on more vigorously. Taking up a considerable amount of paint, these brushes allow a large portion of the canvas to be painted most rapidly.

rapady.

The "brushes" are painting brushes of variable thickness, used especially in painting the details of the picture; they are handled with one hand, the same as the long carbon-holder, used to trace a sketch in proper dimensions.

The draftsman, who by means of this carbon-holder and the long ruler with its stick, transfers to the canvas all the measures and profiles of the "maquette" (Fig. 4) is in French studios called "transer" (transer).

The "palette" (Fig. 2) is a sort of large box in which hues, taken from earthenware pots containing liquids of all colors, are prepared for laying on.

In tracing circles of large diameter, a pencil attached to the end of a string is used; for smaller circles large, wooden compasses are employed. Of other tools invented by the ingenuity of scenic painters should be mentioued a nort of square box supported on two unjittle connected by a horizontal handle, for use in transporting the color pots from one point on the canvus to another. Other utensits of the seemle painter are: the "duster," a long stick carrying at its end some strips of cloth, which is used in blotting out the carbon outlines and any errors made in tracing; a long wooden ruler carrying at one end a sharp point and at the other end an adjustable penctl, which also serves to trace, though in a much more serves to trace, though in a much more serves to trace, though in a much more jerfect manner, any circles of large diameter, and, finally, a big square, 3½ meters, 2,3½ meters

Oil painting is never used by the scenic painter. Apart from their prohibitive cost, oil colors would, in fact, make the scenery too heavy, and would dry much too slowly to allow the painter to walk on the canvas. Moreover, oil painting, on

Market State of the

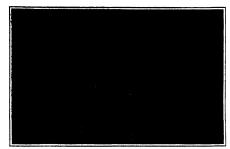


Fig. 5 .- A theater curtain design, to be transferred to the canvas



Fig. 6 .- Joiner cutting the curved outlines of scenery frames.

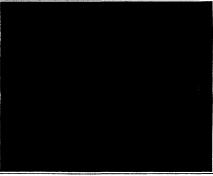


Fig. 7.—Rolling up a finished piece of canvas. Scenic effects tested on the wall.

account of its brilliant reflexes, would be disagreeable to the eye. Nor does the scenic painter use bensine or varnish.

His colors are of a special kind, dis satched in barrels in the form of powders or pastes of all the hues of the pal-ette. Powdered colors are dissolved in water and agglutinated by means of heat ed glue Color pastes are more brilliant, but are apt to congent at low temperatures As soon as the color is prepared, poured into pots. Whenever nt is poured into jois. Whenever large surfaces are to be covered, e. g., in pre-paring the priming, whole buckets of paint are poured out on the canvas by means of the very largest brushes. On drying, the glue fixes the color on the canvas. By varying the amount of water and glue, colors of any desired thickness can be obtained; a special advantage of these colors is their remarkable case of hand. ling and the minimal resistance they opto the brush.

Before using the canvas, the tracer, in order to facilitate his work, makes a drawing on paper in real dimensions, which is pounced on the canvas (Fig. 5) Some of the tracers are remarkably skilled and are most interesting to watch in touching up with the ends of their car-bon-holders the curvature of a volute, or in designing a decoration, etc. They also mark with chalk those points where light effects should be obtained. Their task finally comprises the designing of the per spective, which in the case, for instance, of a complicated masonry is by no means casy. They go to and fro over the canvas with their slippers on, and seem even more at ease in drawing in their upright position than if they were seated at a table. The skill they acquire by practice is wonderful and it enables them to achieve real marvels Tracers, like paint-ers, should have a good knowledge of styles. Carelessness in their work is only too often responsible for failure of the whole painting, while nothing facilitates so much the painter's task as a satisfactory tracing.

After stretching the canvas out on the ground and falling it by means of drawing plus, the first litting to do be to coat it with a white priming. When this is dried, the tracers transfer on the canvas all the different measures and profiles of the "magnett", using a speedal ink in marking any characteristic details. Only after the tracer's work is done and a framework of outlines obtained on the canvas, does the pointer's task begin. He first applies, as on an oil painting, the fundamental layers reproducing the general outlines of the picture, always remembering that the colors thus used freely will lose much of their intensity in drains.

Any details are then brought out with the finer brushes, which on account of the size of the panel and its position on the ground is by no means an easy task, in connection with architectural interiors, some details of decoration have sometimes to be accommand by means of a

(Concluded on page \$55.)

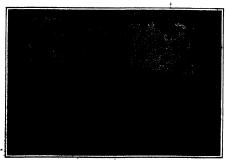


Fig. 8.—Last retouches on the stage; the scenery having been installed.

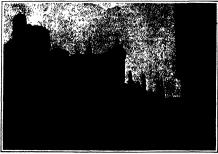


Fig. 9 .- Finished exterior view of a scene from the third act of "Faust."

#### The Twin-screw Motor Vessel "Monte Penedo" By Our Berlin Correspondent

THE twin-screw motor vessel, "Monte Penedo," rethe order of the Hamburg-South American Steamship Company, in so far represents a most interesting new type of vessel as it is the first large transatlantic freight ship to be equipped with two-cycle Die

motors

The "Monte Penedo" is 350 feet in length, 50 feet in breadth and 27 feet in depth, her gross tonuage being about 4,000 registered tons and her carrying capacity about 6,500 tons. She has two continuous steel decks, a long poop and forecastle, a continuous double bottom and an elevated ballast tank, four holds, 6 watertight transversal bulkheads and two masts, and comprises the most up-to-date loading and unloading de vices for the handling of goods up to 35 tons in indi-The dwelling rooms for the captain and vidual weight officers are arranged amidships, and those for the machinists at the rear on the poop deck, whereas the sailors are accommo-

dated below the fo'-castle and the englneers below the poop The "Monte Pene-

do' is operated by two reversible, four cylinder, two-cycle, Diesel-Sulver erude oll motors of a total output of 2,000 indi cated which drive the vessel, at full load, at a speed of about 10% knots. The auxiliary machinery comprises a 50 horse-power Diesel dynamo, a 50 horse power compressor, an auxiliary steam-oper-ated compressor, an auxilinry condensing plant, and a condensed water re-cooling plant. Most of the auxiliary machinery is operated by steam generated by oll-fired auxiliary boiler. The steering gent is actuated by pre-heated compressed The oil bunkers alr. are protected by spe-cial safety devices against any risk of fire, as well as against

injury and leakage in the event of collision, so that all requirements with regard to the safety of the vessel are fully complied

THE

The Suizer two-cycle motor installed on the "Monte Penedo" show some important advantages over the four-cycle motors of the recently-built motor vessels "Sebandia" and "Christian X". They are, in fact, considerably smaller and lighter with an equal oil considerably smaller and lighter with an equal oil consumption, and as their space requirements are less, the sumption, that as their space requirements are less, the space and weight left for the installation of the cargo are considerably greater. Moreover, two-cycle motors are cheaper and simpler in design, so that the cost of repair is lower. It is claimed that there is a certain advantage in two-cycle motors over four-cycle motors because of their superior maneuvering capacities.

In order to give an idea of the advantages to be expected from the adoption of such motors, it may be said that the saving in fuel as compared with quadruple expansion engines during a voyage of 13,500 nautical niles from Hamburg to Buenos Aires, will be 1,073 tons, and on the home voyage 537 tons, i.e., an average of 805 tons, while the saving as compared with triple-ovpansion engines is 1.323 and 662 tons, respectively, the average being 903 tons. When adding this to the saving in weight due to the smaller weight of Diesel-Sulzer motors, the total saving or surplus capacity works out as follows: As compared with quadruple expansion engines, a surplus capacity of 975 tons, i.e. about 15 per cent, and as compared with triple-expan-sion engines, a surplus capacity of 1,103 tons, or 18 per cent.

uring the recent trial trip a speed of 13.8 knots was obtained

The "Monte Penedo" has just started on her maiden voyage to South America.

Tokio Bays Molor Fire Engines.—The Japanese capital has just installed eleven motor fire ongines, in an attempt to reduce the terrible annual loss by fire in that city. The care are driven by gasoline, while the pumps are worked by steam.

#### The Improvement of Fifth Avenue

FIFTH AVENUE, New York, is a street of national Interest. It is the most exclusive shopping street of the nation's largest city, lined with the highest priced shops displaying signs of famous foreign houses. In spite of many fine buildings, the avenue, outwardly, falls short in many ways of its business reputation. Many of the stores are modified brown stone dwellings.

The recent widening of the roadway of Fifth Avenue from forty to fifty-five feet, and the wholesale removal from the sidewalks of building encroachments, greatly increased the traffic capacity nue. Four lines of vehicles can now move along instead of two or three. Recently a municipal commission has recommended attil more improvements, which are on the eve of being carried out, viz., further widening of lesigning of squares, tree planti where possible, better lighting, isles of safety, public cab stands, limitation of the height of buildings, and reduction of sidewalk congestion.

There is one side to Fifth Avenue of which no

room, showing the valve mechan-motors of 2,000 horse-power.

er platform in the engine of the two-cycle Diesel

The "Monte Penedo," first large transat-lantic freighter driven by two-cycle motors

marked improvement has yet been attempted. That is the engineering side. True, the asphalt pavement is now laid on a concrete base, and every effort is being made to get the surface durable and free from defects The street is very smooth in the main, and is kept well cleaned. The chief defects are those due to past practice. The question is: Would it be worth while to remedy them?

The most noticeable shortcoming inherited by Fifth Avenue from the past is in its surface drainage. The street has very little slope from the center to the guiters, and the gutters have very little slope toward the catch basius; with the result that little pools of in after rains, and even for some time after sprinkling. These pools, though injurious to the asphalt, are not objectionable to the public except when they occur at street crossings, which is the case, owing to the lack of slope of the street.

During a rain storm the defective drainage is most apparent. At such a time streams of water are often encountered in crossing the street, although the highway practice requires that no water should flow past a street crossing. A study of the location and frequency of catch basins along Fifth Avenue shows why so much water is user. Comment basins are found, and these are sizes on the street corners, where the water pass two crosswalks. This old cast or objection of causing the curb to where it is most used. It is considered the tice at a street junction to have the higher the gutter exactly at the street comer, the wing down each street to two catch basins clo ing down each street to two cauch means cross in Fifth Avenue were constructed to-day along m lines, there would be one hundred and sixty basins to a mile, or eight at every street into Instead, there are only from eighteen to the found per mile.

Again, the gutter-mouths leading into the catch basins are often small, and the gratings much clogged with street sweepings. Sometimes the street surface with street aweepings. Sometimes the street eurance slopes the wrong way, so that water flows by a heain and by a cross street. Instead of having heains every 200 feet, which is considered desirable in the built-up sections of some cities, as long a distance as 1:600 feet has been found without a catch basin. Moneover, there are no outoh basins on

the cross stre though these are 800 feet long, west of the avenue. Still another place where water lingers is in the covers of certain-catch basins on the side-walks, and certain manhole covers in the street, owing to recesses in the covers

whether it is worth while to reconstruct Against doing so is the cost, involving in the case of Fifth Aveuse the raising of the vel of the street center, changing gutter grades, building all new cutch busins, in new locations, etc. On the other hand, reconstruction of every-thing in a city is necessary with some frequency. Should not an avenue of the importance of Fifth Avenue be kept up more nearly to modern standards? To The

more and more, making radical alterations more diffi-cult in the future. The desirable thing would seem to be to begin the reconstruction of the avenue, half the width and one block at a time. Pipe galleries should be introduced under each side of the street, as is done with new streets in London. Manholes should be locate as not to be in the way of travel when they have to be opened. Iron covers should be banished, and nonslipping covers adopted which will not hold water.

Such changes should not be regarded as unnecessary refinements. It is necessary in private business to keep adopting new methods and new equipment. Why not in the public business as well? Some American cities are doing this, but too often it is along only a few lines. Every municipal department should be encouraged to study out improvements, and ideas should be exchanged even more than now with other citi

#### Non-astringent Persimmens

THE popular demand for the large and beautiful Japanese perdimmon has been retarded by the marked astringency of the fruit when firm and tempting to the eye. Moreover, if the fruit is allowed to ripen until the "pucker" is lost it becomes soft and ripen until the purser is not it becomes not and mushy, decaying very rapidly. In Japan they have for years practiced the art of removing the "pucker" by sealing the firm fruit in barrels which have been rinsed seating the arm truit in narreis which nave been ranses with "sake," a sort of Japanese been. Our Bupsen of Chemistry finally took the hint and have recently found that the same effect is obtained by isosping that pershamion in carbon discride from three to live days. me varieties come out of this "processing, Some varieties come out of this "processing," as it is called, as size, as an apple and may be pessed and esten called, as size, as an apple and may be pessed and esten like an spigle with great established. One sixter and another processing the six of the six of

## An Electric Stove

THE RESIDENCE OF THE PROPERTY OF THE PROPERTY

ATE convenience and utility of electric heating apparatus have so long been recognised that were it not at the high cost of electric energy, as compared with the high cost of electric energy, as compared with the high hardly any honeswife could now be perfisaded to cook with any other than an electric store, at the time of the convenience of the convenience. For those who have electric cursuit in their homes and would like to make such occursors in their homes and would like to make such occursors in their homes and would like to make such occursors in their homes and would like to make such occursors in their homes and would like to make such occursors in their homes and would like to make such occursors in their homes and would like to make such occursors have been a such as the contract of the contra



Fig. 1.-The stove complete.

pe made at home at a cost for materials of but a fraction of the regular price of the commercial article.

An electric stove is a very simple and efficient piece of apparatus. It is practically nothing but a piece of wire which is heated red hot by the passage of the current through it, and it is easily made because success depends more on the selection of proper materials than on skillful workmanship.

rials than on skillful workmanship.

As shown in the photograph in Fig. 1, the body of
the stove consists of a freproof box about seven inches
equare and three inches high. This may be built up
of four pieces of asbestos board, about ¾ inch thick,
fastened together by corner pleces bent up from sheet
copper or brass held in piace by small brass machine
screws and nut. Asbestos shingles also sever the purpose well, and these are cheap and easily obtained
from dealers in builder's materials.

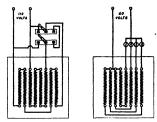


Fig. 2.—Diagrams of connections.

The essential part of the apparatus is, of course, the beating element, shown more clearly in the photograph in Fig. 8. The base of the heater is a square of the subsetors beard cut to fit inside the hox, and having four strips of the same material riveted to it so as to form a sort of picture frame four inches square inside. Across this frame are stretched the eight pieces

of wire which form the heating element itself.
Of the many different makes of wire on the market one of the best is the "Nichrome," made by the Driver-Harris Wire Company, of Harrison, New Jersey. The heater shown in the photographs was made of gage number 22 Nichrome wire, which has a resistance of



Egg 5. The store party drawnabled.

about one ohm per foot. The weight of wire actually used in this store was only 1½ ounces, but it is advises able to order at least one hair pound of the wire, as wire-drawing companies do not, as a rule, care to book orders amounting to less than one dollar.

The eight helices for the heater are such formed by winding 138 turns of the wire closely around a rod just one eighth of an inch in diameter, on which the turns will cover a length of 3% inches. The rod is then removed and the ends of the wire best up into eyes, by means of which, after a slight striction; they may be attached to the subserior frame by small turns machine scrows fitted with nuts and washers. If each serve be provided with two nuts on the heatt the closer trical connections are very conveniently made by clamping places of No. 16 copper wire between the nuts.

Diagrams of connectious are shown in Fig. 2 For 110 volts the arrangement shown provides three for ferent heats, two double-throw single-pole switches being employed. When both bindes are closed to the left the heater develops full beat, and consumes about 850 watts. Opening either switch reduces this to one half, and closing both bindes to the right gives one quarter heat. For 60 volt isolated plants another scheme of connections is shown, in which the heater is divided into four sections, each under the separate control of its own samp switch.

The heating element is best supported in the box by means of strips of asbestos board riveted on the inside. The wires must be low enough down so that metallic cooking utonsils cannot touch them and cause a short circuit. If the cooking utonsils to be used are too small to cover the entire top of the lox it is resential to provide a top piece of asbestos board, as shown in Fig. 1, to cover the open corners and prevent waste of heat.

To make the stove ready for use as a radiant toaster, it is sufficient to cover the top with a square of coarse wire cloth upon which to lay the slices of bread.

#### Studying Prismatic Colors of Incandescent Lamps with a Reading Glass By Stuart K. Harlow

THE following interesting investigation of the different colors of the spectrum of the filaments of the tungsten and carbon incandescent lamps was carried out with a 2½-drach diameter manifying glass. The first lamp tested was a 40-watt Mazda lamp,

The first lamp tested was a si-west Mazda lamp, suspanded from the celling in a white correspond other shade. The reading glass was held horizontally below the lamp and at a distance of 12 to 16 thebes, with a 12 by 12-inch square sheet of 12 to 16 thebes, with a 12 by 12-inch square sheet of white cnameled paper held parallel to the reading glass and at the proper focal distance from the lens. The superior color was found to be white, which was fringed with yellow, orange, red, green, blue, and violet. All these colors do no appear in the scene at one position of the lens, because the principal focal distances in the double convex lens are different for different color; being less for violet than for red. This phenomenou is known as chromatic absertation. It is eliminated in our particular experiment by moving the hand lens back and forth, thue varying the focal distance. Sp holding the lens at an angle to the incandescent lamp, the illiminated flament appears inclosed in its bulb and shade.

The next lamp tested was a 16 candle-power 50-watt carbon filament incandescent. The lens was held in the same position as slove; the filament appears as a broad incandescent band, in which yellow, together with white are the superior color, red being present to a greater degree than it is in the tungston lamp. This incandescent band was fringed with orange, red, green, blue, and viole in the property of the pr

A karosene oil hand lamp with wick and the ordinary glass chimme, when the lens is held parallel to the flame and at a distance of 3 foet, its spectrum appears as yellow with slight traces of white, and orance, red, and green around the edges. When the lens is held at a distance of 12 feet from the illuminant, the spectrum appears as a small circle three-siticenths in diameter, the center of which is brown, but still showing traces of red, orange, yellow, green, and blue.

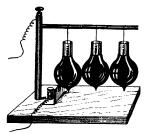
It might be interesting in this article to mention an observation of the New York Testing Laitonstories exhibit at the 1900 Chinago Electrical Show at the Collicum. It consisted of there projection mechanes mounted with suitable lenses to project the arc spectrum of the finning arc, magnetite arc, and carbon arc on a cauras seroen a few feet away. The image of the finning are showed yellow, onego, red, blue, and purple; magnetite arc, white, yellow, and blue; and the carbon arc, green, yellow, orange, and purple. The carbon arc appeared thin and dim on the cauras screen.

## Leyden Jars Made of Incandescent Lamp Bulbs By Maxwell Epstein

O give best results, a Leyden jar must have a good disjectric with little thickness. Ordinary burnt-

can easily be converted into excellent Leydon jars. The best built can be selected by rubbing with alik in a dark room. Those that glow most make the best jars. A slit is cut across the threaded motal top with a back saw, and the thin bruse is peeled off with a pair of pliers. The leading-in wires can now be easily cut, the top taken off, and the built cleansed of the insulating compound. The grower at the junction of the ingoing glass with and the built, is scratched with the sharp point of a broken the moleculed with turpentine, until the tube with the filament can be pulled out.

The bulb is now conted outside with tinfoil to within 1½ inches of the top, and filled inside to the same height with scraps of tinfoil. A piece of No. 20 B. & S. copper wire, hooked at one end, is thrust



A battery of Leyden jars.

through a half inch cardboard disk and into the bulb. The top is now sealed with sealing wax

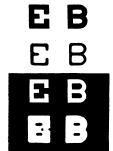
The analgam used for conting mirrors is preferred to the tinfoll inside, if it can be obtained or made as described in the Scientific American of April 8th, 1911. By hooking these jars on a brass rod and pushing them together, as shown in the figure, excellent variation in capacity can be secured for the closed circuit of a wireless transmitter.

#### Relative Clearness of White and Black Letters By Samuel W. Balch

THERE is a general tendency on the part of railroads to adopt signs with white letters on a black
background, not realizing that the black letter on a
white background is easier to read and can be seen
at a greater distance. This follows in an interesting
way from the structure of the retina of the eye. The
impression of a letter at the limit of vision is received
on the cuds of a small bundle of meres which convey
to the bright a sort of messic humers ston.

on the class of a shand bundle of nerves which convey to the brain a sort of mosaic impression. A nerve can only transmit to the brain information as to whether or not a ray of light be failing upon it and when a nerve is partly, in the light and partly in darkness the sensation is the same as though all of it was in the light. It follows, therefore, that all nerves on the dividing edge between any black and white area transmit the sensation of light so that all white lines and white areas appear wheter and all black lines and black areas appear untrower than they really are. The two black letters in the Illustration grow thinner

The two black letters in the illustration grow thinner at the limit of vision and are still reconsizable, while letters grow thicker at the same distance the two white letters grow thicker and cannot be distinguished. There are circumstancesses when it is necessary to use white letters, but in such cases logibility will be improved if they are made with a thin stroke and strongly lighted. Black lotters are more distinct if made with a heavy stroke.



How black letters and white letters change at the

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Notes for Inventors

A Toy Puzzle.—In a patent, No. 1,038,-0. Waldemar J. P. Olsen of Brooklyn, N 1 presents a patent in the form of an egg-shaps shell within which is a tilting plate and a weight is movable on the plate and operates in connection with small balls secure a balancing of the shell under certain conditions

Cork Articles from Granulated Cork In patent No. 1,035,146 Louis L. Bontley of Beaver Falls, Pa., assignor to Armstrong Cork Company, of Pittsburgh, presents a method in which granulated cork is preheated to a temperature below the melting of the cork resin and is then fed while hot into molds. Pressure is applied to the cork in the molds and the cork is baked while under pressure high enough to melt the resin This resin as it cools cements the granules together.

Increases Butter Yield from Milk.-A Increases Butter Yield from Mur.—A. Hamburg, Germany, man, Adolf Wilhelm Karl Witte, in a patent, No. 1,039,627, describes a process of treating milk and cream to secure an increased yield in butter and in which he cools the material to a temperature somewhat above freezing point and maintains it at such temperature for about twenty-four hours and then quickly warms it to a temperature of 18 to 20 deg Cent., adds a souring generator or "starter" and immediately churus the maternal whon it is ripe.

Utilizing Moving Pictures in Target Practice.—We are constantly learning of new uses for moving pictures. Now James of London, Eng., in patent No. 1,035,811 provides a target divided d sections with means in each section for completing, by contact, electric errorits, and moves the target behind the picture screen, synchronously with the nged at the firing point and is operarranged at the tring point and is open-ated electrically from the target so that as a shot is fired it can be determined in-stantly whether a hit has been made

A Machine for Making Bale-tie Buckles -Ezra A. Frantz of Weatherford, Texas egnor to Frantz Buckle Company of at place, has secured a patent, No. 1034,007, for a machine for making balo-tie buckles in which there is mechanism for feeding the wire and for cutting it off and a means operates at a right angle to and across the path of the feeding mechanism to give one head to the wire while another means operates in the direction of the feed-ing mechanism to give another bend to the wire and a final buckle forming means wire and a final buckle forming means operates at an angle from the opposite side of the movements of the two bending mechanisms and the feeding, bending and forming mechanisms are operated in proper

New Patent Legislation in New Zealand -A new act relating to patents, designs and trade-marks went into effect July 1st, The new a in New Zealand fors from the old chiefly by the inclusion of provision that any patent not worked in New Zealand within four years from the date it is granted, or within two years after the commencement of the new act, may be d by the Supreme Court on the petition of the Attorney-General or upon the petition of any other person with the leave of the Attorney-General The American consul suggests that it is ordinarily the part of wisdom for American manufactur-ers whose goods are suitable for New Zealand and who intend to introduce them in such country, to secure New Zealand patsent sa otherwise initations may be made also that the title The Automobile Tode by the New Zealanders, many of whom Directory is not so smiller to the title possess mechanical ability of a high order, The Cycle and Automobile Trade Directory and the spirit of invention is such that it often causes improvements on imported inventions.

#### Legal Notes

Patentability on Interference Appeal The Court of Appeals of the District of Columbia in the case of Hopkins v. Cleal, Cleal v. Hopkins, has held that on an appeal from the decision of the examin awarding priority, the question of patent ability of the issue will not be considered.

ability of the issue win not be considered.

The Importance of Dilligence.—The Court of Appeals of the District of Columbia rarely loses an opportunity to emphasize the importance of diligence on the part of an inventor. In the recent case of Courson v. O'Conner, O'Conner conceived the invention in November, 1998, and immediately set about reducing it to practice and filed his application on Feb ruary 4th, 1909. Courson who had con-ceived the invention in 1898 made devices and tested them; but such tests were in and tested them; but such tests were in-sufficient to establish a reduction to prac-tice. The last of these tests was just prior to O'Conner's conception. Courson did nothing further with the invention until his application was signed on January 19th. 1909, which application was not filed till February 8th, 1909, and the Court held that Courson had every facility at hand to enable him speedily to reduce his invention to practice or file his application at a much date, he was lacking in dilig and that priority was properly awarded to Conner. The decision goes on to quote that Mr. Justice Robb said in a previous O'Conner. case to the effect that there is no arbitrary rule or standard by which diligence may be measured, the sole object of the law being to mete out the fullest measure of justice, and each case must be considered and deuded in the light of the circumstances of that case. The nature of the invention the situation of the inventor, the length of time intervening between conception and reduction to practice, the character and reasonableness of the inventor's testimony and that of his witnesses—are all important factors in determining the question of diligence.

#### Trade-mark Notes

A Trade-mark Opposition.-In the case A Trade-mark Opposition.—In the case of Consumers Company v. Hydrox Che-mical Company, Assistant Commissioner Tennant has decided that the opposition properly dismissed since peroxid hydrogen does not constitute goods of the same descriptive properties as distilled water nor merchandise of such character as to come within the natural expansion of the previous business of the opposer.

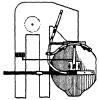
Difference Between Trade-mark and Patent Interferences.—In pointing out a distinction between a trade-mark interferonce and a natent interference. Mr. Justic Robb of the Court of Appeals of the District of Columbia has said: "In a trade mark interference proceeding, the issue which the Commissioner is called upon to determine as not merely one of priority, as in a patent interference proceeding, involves any issue that might be raise an ex parte case. (In re Herbst, C. D. 1909, 333; 141, O. G., 286; 32, App., D C,565)

Trade-mark Applied to Publications.— in the case of Chilton Printing Company The Class Journal Company, Assistant V The Gass Journal Company, Assistant Commissioner of Patents Billings has de-ended that the words The Automobile Trade Directory as applied to applicant's publication must be held to constitute a valid trade-mark, these words not being so wholly descriptive of the publication as to fall within the prohibition of the statute;

RECENTLY PATENTED INVENTIONS These columns are open to all pates notices are inserted by special as with the inventors. Terms an applic Advertising Department of the AMERICAN.

The Control of the Co

Of interest to Farmers,
AUTOMATIC GRAIN WEIGHER—I. L.
ADIEN, Edgar, Clay Co., Neb. This device its operated automatically by the weight of grain at receives. It comprises a hollow vas-sel with an insist at one out and an outer at the other, and comprising means by which grain can enter the vessel until its limit of capacity is reached. Means also provides for the automatic discharge of the grait, and it



ATITOMATIC GRAIN WEIGHTER

passes continuously into the receiving reasels at one end and is delivered at the other, being retained long enough to extract the mechanism which controls the outlet, and to register the times the outlet mechanism is actuated in this way, so as to indicate the measure of the total quantity of grain passing through the weighter. A side view of the total quantity of grain passing through the weighter. A side view of the device is shown in the Binstration

SLEEPING BAG .-- G. W. GAIL, Jr., 1814 Park Ave., Baltimore, Md This invention pro-BLEEPING BAG.—G. W. 6416, Jz., 1616. Park Ave, Battimore, Md This invention provides an absolutely waterproof bag designed particularly for out of door use, as by camp ers. It provents the entrance of any water at the bead of the bag, and while excluding water at the head provision is made for proper von



SLEEPING BAG

tilation. The occupant may enter the bag conveniently and binaiets may be held in proper position with the bag, and a mosquilo proper position with the bag, and a mosquilo portion in a way to perfectly actived inserts. The illustration shows the bag staked to the ground, and in position for use HOTTLES WITHINGTON, T. R.K., 6 Warran HOTTLES WITHINGTON, T. R.K., 6 Warran view of the properties of the properties of the provided and inseasuring devices for dispensing receptacles, and has for an object to provide a structure which will dispense prefetershined quantities of liquid, anism acting as a stopper for bottles and anism acting as a stopper for bottles and

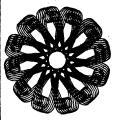


BOTTLE STOPPER.

the like, from which liquid is designed to be disponed, which will permit the drawing of successive predetermined quantities or liquid from the receptacie, but will resist any refligion of the receptacie through the discharge point. The engraving shows a longitudieal worthed section through the invention as applied to a bottle.

LEAK FURDE NOS AMMENTS.

mant, designed expicately for preventing system or coverages beedping of the leadings of configuration of the leadings of configuration of the leadings of configuration of the leading of



EXAMPLE OF DESIGN DEVICE WORK.

acter. Means provide for articulating the base to any one of a plurality of points on the rocking plate to adjust the position of the galde relating to the pivot point of the table, and to articulate an end of the bar to a member having continuous rotary movement instead of the rocking plate. The engreen the provided of the rocking plate. The engree has a example of the design work of this pivestron.

MAIL BAG AND BAG SUPPORT.—H. T. COOK, 332 So. Michigan Ave., Chicago, Ill. This invention has particular reference to a bag with means for supporting the bag in open This invention has particular reference to a bag with means for supporting the bag in open position, particularly within a letter box, so that the letter dop directly into the bag, it being only necessary for the collector to substitute an empty bag for the hag removed. This also avoids unnecessary and frequently injurious handling of a mass of letters includent to removing them from the box in the ordinary way.

Eardware and Tools.

COMINIATION TOOL.—Fav. C. Baves,
Clars City, Minn. in the accompanying segraving one of the implement of the tool is
shown in operative position, and in a folded
or leoperative position in determine the tool
handle is formed with a looped end having
congesting arms normally tending to more toward sead other, between which the ends of
the semestries tools or implements are about the respective tools or implements



COMMINATION TOOL

COMMINATION TOOL.

A piccel in it passed through all of the implements so that the same swing on the amm pircel scene and may be moved in and out as desired, the respective implements between the company of the compa

tion wher released.

FIFE SERAMER.—D. M. Harrow, Burnet's

Creek, Bernettwille Station, Indiana. As object here is to provide a device of a reiatively simple nature for resulting pipes in

string simple nature for resulting pipes in

string simple nature. For resulting pipes in

string simple nature for resulting pipes in

string simple string simple simple simple simple of regions see, these parts being capable

of quiet application to the main supporting

feature or records from it.

Vertical section through the invention as a seplied to a bottle.

LEAK STOP FOR LAWRES, DIKES, ETC.

LEAK STOP FOR LAWRES, DIKES, ETC.

M. M. NAMARS, St. Pertick, La. This isto various is a province of the section of the sectio

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of a greater number of early reporters to the last server year. Ingression by so
or granulated Wiles for PREE establish
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F. Lobors, Claff harmony
10, Schiffler Hidg. Chicago, Hite

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a view to enable the operator to move the batt carrier into engagement with the latch member, when setting the trap, without danger of his fingers being caught by the striker.

of his dispers being caught by the striker.

INVISIBLE, HINGE, — R. ECCERMAN, 2005

Elmball Ave., Youkers, N. Y. This invention
provides an invisible hinge for use on doors
boxes, planos, furniture and other articles and
devices, and arranged to be invisible when
the door or other movable member is in a
closed position, and provides a space between
doors and the standard of the standard of the control of the

Homeshold Willities.
COOKINI APPRARTUS. W. E. BAYTER.
care of Varbe-Fracier Co. L.d., Louisville, Ky.
The construction in the side of a combined cooking and heating store and
combined house and camp (or portable) store.
The invention provides a non-breakable crate
and support adapted to inclose the store proper
for adipment, carrying by hand or storage for
the store proper when the crate is placed
below the store proper.

\*\*The Note of the Cooking of t

LEG REST FOR ROCKING CHAIRS—L.
AIME, 25 Haig St., and J. STENGE, Jersey
City, N. J. For the purpose of this improve
ment use is made of a leg rest provided with
rockers and connected with the rocking chair
to support the leg rest in upright position,
and to allow of rocking the leg rest in unison
with the rocking chair.

OR SIMILAR HEWITHCALES—I. B. PERS 800, 401 London Road, Duluth, Mich. The principal purpose here is to so construct the door and attached mechanisms as to provide an officient often extended with will be swalled as the state of cleaner against a head of ore or other material in the potest when it is desired to stop the flow of the same possible of the state of the st DOOR MECHANISM FOR ORE POCKETS OR SIMILAR RECEPTACLES,-R. B. PEAR

stop the flow of the same.

LOOM FOR WEAVING GARIZE—E K
GEER, care of Scholer, Duplan Bilk Co, Hazle
ton, Pa. The object here is to produce a loom
in which the needle reed is positively moved
is facel guides, and in which the fixing reed
is located between the needle and the warp
beam, and is positively reciprocated in a fixed
guide in parallel relation to the needle reed,
and is parallel relation to the needle reed,
and is parallel relation to the needle reed,
and guide the threads.

#### Pertaining to Vehicles.

Pertaining to Vehicles.

RADIATOR RHIELD—F. P. RASERT, Lawrence, J. J., N. Y. This invention pertains to a shield of a type used in automotiles, and is adapted to cover a portion of the radiator and protect it from the coid, so as to prevent an excessive cooling of the water in the radiator, and also to prevent the freezing of the water when the radiator is not in use.

DESIGN FOR A TOILET POWDER DIS-

DESION FOR A COMBINED KNIFE AND DESION FOR A COMBINED KNIFE AND FORK—M S liswirt, deorgetown, Tex. in this ornamental design the article comprises a slightly curved handle to a knife blade or modified sickle form at the point of which and at right angle to the blade extends a short bread four-promped fork.

Norz.—Copies of any of these patents will be furnished by the SURNTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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## A New Model of the Silent Gray Fellow

MORE pulling power at low speeds, more power on the hills, more reserve power for sand and That was the demand our engineers set out to satisfy by building the

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S actual horse-power—35 cubuc inches piston displacement). Dynamometer tests show that this motor develops 166 per cent, more power at 5 miles per hour than even the former 4 horse power 18 miles per hour than even the former 4 horse power 18 miles an hour. 80 per cent, more power at 20 miles an hour, 80 per cent, more power at 20 miles an hour, 80 per cent, more power at 20 miles an hour, 80 per cent, more power at 20 miles an hour. 80 per cent, more power at 20 miles an hour, 80 per cent, 18 miles power at 20 miles an hour, 80 per cent, 18 miles power at 20 miles an hour 18 miles power at 20 miles and power roads that from a standing start to forty miles an hour in 300 feet; but we prove the standing start to forty miles an hour in 300 feet; but we prove the standing with higher rating.

The pub-proving base plenting is though of springs between the offer and amendment of the proving between the standing start to forty miles and the second standing at 18 miles and 18 miles power at 20 miles and 20 miles and

HARLEY-DAVIDSON MOTOR CO.

#### The "Immortality" of Tie (Concluded from page 864.)

Concluded from page 38.)

diminution after a certain age until the growth altogether ceases, and the size of the animal is determined. But it was found by subjecting these artificial growths to washings in sait solution that he mass was frices times preside at the the mass was fiften simes preser at the end then at the commencement of the third month, shoring that they do not prove old at all! In the artificial growth the problem of seniity and death is solved! It was the announcement of this "permanent life of tissues" that caused such a furor in Paris last summer, and ral eminent scientists to demand ocuseveral eminent scientists to demand ocu-lar demonstration, because "the discovery, if true, constituted the greatest scientific advance of a generation."

The following summary of this inter The following summary or this inter-esting and vitally important and epoch-making work of Carrel is translated from an article published in Paris recently by Prof. Pozsi,\* who witnessed the experi-

"Carrel found that the pulsations of a fragment of heart, which had diminished in number and intensity or ceased, could be revived to the normal state by a wash ing and a passage. In a secondary cul-ture, two fragments of heart, separated by a free space, beat strongly and regu larly. The larger fragment contract es a minute and the smaller 120 times For three days, the number and intensity of the pulsations varied slightly. On the of the pulsations varied signify. On the fourth day, the pulsations diminished con-siderably in intensity. The large frag-ment beat 40 times a minute and the lit-tle fragment 90 times. The culture was washed and placed in a new medium. An hour and a half after, the pulsations had become very strong. The large fragment contracted 120 times a minute and the small fragment 160 times. At the same time the fragments grew rapidly. At the formed a mass of which all the parts beat synchronically.

"Carrel then tried to preserve three fragments of heart in a state of functional

activity for several months. One of the three experiments will be described.
"On the 17th of January, 1912, a frag-

ment of the heart of an embryo chicker of seven days was placed in plasma. It grew rapidly in a thick crown of conjunctive cells. At the end of some days, the pulsations, which were regular and strong at the beginning, grew feeble and ceas completely. For more than a month, the fragment remained immobile. On the 29th of February, the culture which had been subjected to fourteen passages was dissubjected to fourteen passages was dis-sected, and the central fragment was placed in a new medium. After the fit-teenth passage, it was observed to con-tract rhythmically, and that the pulsations were as strong and as frequent as on January 17th. The number of the pul-sations was from 120 to 180 per minute. During the months of March and April the small fragment of heart continued to beat vigorously at from 60 to 120 time per minute. As the growth of the con junctive tissue became more active, it was necessary before each passage to extrpate the new connective tissue that had formed around the muscle. On the 17th of April the fragment beat 92 times a minute. The contractions were regular and agitated all the mass of tissue and the neighboring part of the middle of the culture. On May 1st, the pulsations became more feeble. They were then sub-jected to their thirty-fifth passage. In the course of the manipulation, the muscular tissue was stretched and torn. The rhythmic contractions definitely ceased."

Experiments to date seem to establish that the connective tissue, at any rate, is "immortal."

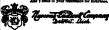
From this research, it is possible to arrive at certain logical conclusions, which, however, it remains for the future to confirm. One, and the most important, is that the normal circulation is that the normal executation of the blood does not succeed in freeing all the waste products of the tissues, and that this is the cause of sentity and death.

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- Lieberten Reniss.

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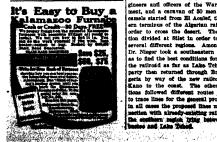
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Were science to find some way to wash the tissues in the living organism as they have been washed in these cultures, man's life might be indefinitely prolonged.

#### A Scenic Painter's Studio (Concluded from page 210.)

special mordant on which gold foils are

Movable scenes are dealt with in the same manner as the large background scenery. The canvas used in this connection is stretched out on special wood-work frames made by the joiner (Fig. 6). In order to facilitate the shifting of these frames special importance should be attached to making the frames as light and substantial as possible; they are supplied to the scenic painter on his own plans (sometimes in conjunction with the theater foreman)

The making of scenery rend tically cut foliage, tendrils, and similar fine details is an especially difficult task. The following process has been of late adopted in this connection: After painting the scenery and cutting out its oute, it is turned around and lined with a fabric consisting of light meshes of black yarn. This fabric is cut to the proper dimensions and coated on the back with heated glue. Before the latter has dried, small strips of tissue paper of different breadths (in accordance with the shape of the leaves) are applied, thus obtaining a substantial whole.

In order to allow the effects of scenery to be tested after completion, an observation bridge commanding a good view of the canvas is generally installed at a height of 15 to 20 feet on one of the walls of the studio (Fig. 7). scenery need only be set up vertically, in order to give the same impression as on the stage (apart from lighting effects), which facilitates the painter's task.

The last thing to do is to apply the finishing touches on the stage, with the electric lights turned on mainly to secure ecordance with the actors' dresses, putting on a new tone here and there and attenuating or reinforcing the tints wher-ever necessary to produce the desired ef-fects (Fig. 8). A finished example of the painter's work is shown in Fig. 9 in an ex-terior view from the third act of "Faust."

#### The Proposed Trans-Sahara Railway

ARAILROAD project of great scope is the Trans-Sahara line, which the French government proposes to carry out in the near future. Not long ago several in the near future. Not long ago serveral expeditions were sent out in order to study the conditions for running the railroad across the desert region, and this part of the work is now terminated. It is thought that the entire plans can be drawn up before the end of this year. Such a railroad will alford a connection between Algeria, Morocco and the desert region, with the French colonies situated in the regions of the Congo and the Niger, so as to inter-connect all the colonies, whence a great advantage will be secured whence a great advantage will be secured not only for commerce, but also for mili-tary purposes, allowing the native troops which it is proposed to raise in the Sen-gal and Congo region to be transported to the north of Africa or even across the the north of Africa or even across the Mediterranean into France under the pro-tection of the fleet. The present expedi-tion consisted of a number of leading en-gineers and officers of the War Depart-ment, and a caravan of 50 men and 120 camels started from El Aouled, the southern terminus of the Algerian railroad, in order to cross the desert. The expedi-tion divided at Silet in order to explore several different regions. Among others, Dr. Nieger took a southeastern route, so as to find the best conditions for running the ratiroid as far as Lake Tehad. His party then returned through British Niparty than returned through British Ni-geria by way of the new radiocal from Kano to the const. The other expedi-tions followed different routes in order to trace lines for the general project, and in all cases the proposed lines make conin all cases the proposed fines make con-nection with already-snights railroads in the contiern region lying between Tim-bustees and Lake Tokad.



## An axle that is an axle

The Hupmobile rear axle is of the full-ating type—a type almost wholly re

The Hupmonic rear axis is on the son-floating type—a type almost wholly re stricted to care of the highest price. The chief advantage of this type is that no load whatever is carried on the axle shafts. They do nothing but drive the

shafts. They do nothing but drive the wheels.

The Hupmobile housing is built up of the two tapered steel tubes, 1, 1, the mal-leable iron central housing, 2 and 3; and the propeller shaft housing tube, 4—five pieces which form a case so strong and rigid that it does not require the support of truss rods.

rigid that it does not require the support trust rods.

The tubes 1, 1, carry the weight of the car. Each wheel runs on two sets of roller bearings, 13 and 14—13 takes the load—14 takes care of the

Thus, the axle shafts, 8, are freed to do the driving, with flanges bolted to the wheels at 15.

The large roller hearings, 5, 5, take only the up and down loads from the differential, the end thrust hearing being taken by two hall bearings just outside the rollers. One of these is shown at 6

In mounting the bevel driving pinion, we use two roller bearings, 9 and 10, inwe use two roller bearings, 9 and 10, inwe use two roller bearings, 9 and 10, inthe gear. They hold on self-de of
bearings, 11, 14 and the permanent alignment, while the ball
bearings, 11, 14 ach en end thrust.

Two threaded adjusters, 7, 7, are
used in our ask to act the bevel gear
so that proper mesh with the driving
pinion is secured and retained.







The worm gear drive of Pierce-Arrow Trucks delivers more of the generated power to the rear wheels than is possible by any other means, because it is the most direct and efficient drive—demonstrated for ten years in England-and proven in this country for over two years in every class of light and heavy service in which Pierce-Arrow worm driven trucks have been operated.

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by prominent department stores, 419 by Central Stations, 516 by brewers, hundreds more by mills and large manufacturers. 937 already purchased by 25 firms. 229 bought by leading express co



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Chicago

## The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and presp This department is never a series of motor trucks and delivery wagons. ia. The Editor will on any questions relating to mechan commercial motor vehicles.

#### "Roundhouse Attention" for Motor Vehicles Ry John R. Englis

THAT more commercial motor validies fall to give satisfactory service because they are not operated and cared for properly than because of inferior de sign and construction is a fact well known to transportation engineers. The modern motor truck and delivery wagon are built to stand hard service, provided they are properly cared for in the garage "Roundhouse attention" is

is the n given to this requirement, and it is taken from railroad parlance. Its significance Its signif in this case is that the motor vehicle should have the same careful attention at the end of each day's work that the railroad locomotive receives at the end of each trip. If the locomotive requires inspection and adjustment at the end of a run over smooth steel rails, how much e should a motor truck receive the same after a long day's work over rough roads, in which it is joited and strained in a way a locomotive is never subjected to The time required for this is seldom longer than it takes a horse driver to un-harness, clean and feed his team at the

lose of a day's work. Such attention pays for itself many times over in dollars and cents. There is st as much opportunity to incre motor truck efficiency in the garage serv ice as there is in providing proper loading and unloading facilities or in routing de liveries. The railroads furnish an Hlus tration of this, in that the total cost per locomotive mile for the four leading line running out of New York, for the year 1911, varied from 4 to 16.6 cents, and the lowest figure was for the line with the severest grades. This variance of the severest grades. This variance of over three hundred per cent must be largely attributed to the difference in

#### The Horse's Board Bill

ONE factor which is exerting a p ice in favor of motor truck is the steadily increasing cost of using horses, purchase price and mainter stable rent, drivers' wages and feed in

According to Census Bureau figures the valuation of horses in the United States has increased 137 per cent in the last ten years, while the increase in num ber has been only 13 per cent. The total number at the time of the last census was

In the same period the value of hay has advanced from \$10 per ton to over \$20, and corn and oats have increased in value proportionately. Land values have increased in most sections of New York, taxes in all sections, and these are the factors which govern the renting value of stable properties. This same condition holds true in practically every mmercial center.

#### Motor Trucks at the Electrical Show

A T the recent Electrical Exhibition in the New Grand Central Palace, New York, motor trucks were well represented. There were half a dozen different exhibits in which the motor trucks were al varying types, from the powerful ones used by breweries to a small baggage truck of two thousand pounds capacity. Mounted upon one of the larger trucks was an automatic bottle capping machine. The machine was driven by power ob-tained from the battery of the truck. The manufacturers of this truck were anxion manufacturers of this truck were analous bows.

I have a superstance of the superstance o

demonstrating his invention, and so the machine and all. The bottle capping ma-chine, which, by the way, was a very inrenious one, served to attract attention to the truck exhibit and also emphasise the fact that the electric truck is very adaptable; for the power stored in its battery may be used to advantage on all er of machinery mounted on it or in its immediate vicinity.

One of the most interesting features of the show was the indoor track on the third floor, where electric automobile demonstrations were made and driving lessons were given without charge, under the auspices of the New York Electric Vehicle Association. Not only were pleasure vehicles demonstrated, but also small electric trucks. To emphasize the fact that very little power is used by a truck, the following sign was displayed:

"Less current is consumed by a one-ton electric truck, carrying a load one mile than by the above lamps, burning one

The lamps referred to were three 82 candle-power curbon filament lamps. By a one-ton truck, of course, is meant a truck that carries a load of two thousand pounds. The weight of the truck itself would be in the neighborhood of four thousand pounds. Thus, we have about three tons, altogether, carried by 300 watts or 0.4 horse-power.

#### Delivery Service of New York's Department Stores By Morris A. Hall

THERE are said to be 1,405 department stores in the United States, of which New York city pessesses not less than 10 per cent, and probably more, Manhattan alone being credited with 90, while a good many of the largest are classified as drygoods stores. These serve

ot less than 15,000,000 people. To do this, it has been necessary in the past to maintain enormous stables of horses, with a tremendous proportion of erve horses in order to take care of all ergencies. With the coming of the emergencies. With the coming of the motor truck, however, this has been changed materially, and although the total number of horses and wagons is still very large, the greater proportion of these is the property of smaller and less progressive firms. In fact, it may be stated that now four of the largest firms are using no horses whatever, and not less than six will be in a similar con-

dition within two years.

The whole number of motor vehicles now used by the New York department stores is estimated by the writer with 525 in Manhattan, and 175 in Brooklyn and other boroughs. Of these approximately 290 are electrics, the balance, 410, gasoline. At the same time, about 3,000 horses are still in use hauling 1,900 wagons. Some of these will never be replaced, but approximately half of them will, making a place with the natural growth of the businesses for about 1,000

fore trucks in the next five years.

Some idea of the extent of area served and magnitude of the general proposition of large department store delivery may or large department store delivery may be gained from a description of several of them. R. H. Macy & Co., for instance, covers all places south as far as Lake-wood and Point Pleasant, New Jersey, as far west as a straight line north and as far west as a straight line north and south through Bouton, Parsippany, Sun-mit, and Fanwood, New Jersey, as far east as Woodbury and Oyster Bay, Long Island, and Stamford, Coun., and as far north, as White Plains, Emmirded and Pearl Miver, New York, and Ransey, New Jones and Pearl Miver, New York, and Ransey, New

Service and the Company

en covered of 2,500 square miles in gold figures; that is, half as big as the

To cover this area in anything like a oper manner requires organisation and well thought out plan. There are nearty depots or sub-stations, the num ber varying with the character of the service. These are supplied by big 3 and 5-ton gasoline trucks, which make the long runs at night, and in some cases during the day. From the sub-stations radiate the actual deliveries by electric radiate the actual deliveres by electric automobile when the distance is long, and by horse when it is short. The majority of retail deliveries in New York city are made from the main store, the Long Island City and Coney Island depots by means of light electrics. These have a radius up to 35 and 40 miles a day, where-as the best the horse can do is 16 to 18. with 22 as a maximum of isolated coun

The entire system includes (the fig es vary widely from one month to another): Forty-two motor vehicles, consisting of 7 gasoline trucks and 35 electrics, 200 horses and 150 wagons. For comparison another large store—John Wanamaker—has 75 motor vehicles, conreasonments—mas to motor vehicles, con-sisting of 70 gasoline and 5 electrics, 275.

P. S. writes: On a recent trip abroad 1 was much impressed by the num-horder and 150 wagons. In the comparigasoline cars in the Wanamaker equip-This shows the individual prefer ence, the Macy Company having always found the electric vehicle very reliable and serviceable, whereas the Wanumaker firm could not be persuaded even to try them until a year ago. Another point is the much larger proportion of horses to wagons in the Wanamaker instance, this firm having 75 more horses for the same number of wagons. It is explained by the fact that horses go out but half a day, placed by fresh horses in the afternoon. This scheme enables the serving of a larger territory per wagon, but requires

Some of the other notable delivery systems of New York city are those of: Gim-bel Brothers, which is entirely metor, no horses whatever being used; J. L. Kesner & Co., of which the same is true; Lord & Taylor, Stern Brothers, Greenhut-Siegel Cooper Company, Simpson-Craw-ford Company, and W. & J. Sloane, not strictly a department store, but having an interesting motor equipment which has gradually displaced all borses. Gimbel's now has 127 motors, 89 electric and 38 gasoline; Kesner's has 45 gasoline vemake: Stern's employs 28 gasoline cars and 2 electrics, as well as many horses; Sloane's has a fleet of 19 cars, of which 4 electrics; the Greenhut outfit includes 17, all electrics, and many horses; Simpson-Crawford, 16 trucks of which half are electric, and 400 horses for 200 wagons; Lord & Taylor, 18 gasoline cars. 18 electrics and no horses; Arnold, Constable & Co., a fleet of 10 electrics, some gasoline cars and a few horses, and so on down to the smaller houses which have practically all horses, but are try-ing out a motor truck or two.

Cost figures are more or less difficult to handle, but it may be stated that the Macy electrics (34) averaged 10.15 cents a mile, while the gasoline cars did over 14,000 miles a year at a cost of 17.48 cents a mile. In the Sloane service, a 8-ton a mile. In the Sionne service, a 8-ton pleasure cars. When road surfaces begin truck, doing 42 miles a day for 200 days to loose and above holes and titls conditions a year averaged 241 cents a find and 17 to loose and above holes and titls conditions as ton-mile. Stearns found that the them motor truck travel becomes destructed to about 13 cents a ton-mile, title, as a heavily loaded, fast moving an automobile unit coupling \$1.700 a year, truck hits each depression with a trip while the same service from horses came hammer blow. As practically all roads to \$8,850 a year, a saving of \$1,913 a are used by the three kinds of traffic you year for each meto-driven unit. Simpless of the destructive and \$164, bloogs there are many opinions on the by autoescalle. Glimbel's delivery equip-such year of \$1,00000 miles that year based with a most destructive ment copyered 1,500,000 miles that year base with a mondalm top, the surface of with an apparating cost of 6 cents a hose, which is beauth with a heavy oil of tar, make and, a detail open of \$20 cents a last, which is beauth with a heavy oil of tar, make and, a detail open of \$20 cents a hose, which is beauth with a heavy oil of tar, make and, a detail open of \$20 cents a last, would be the best for motor traps travel.

"a corner approximately 25 by 80 Greenhut's 1,000-pound cars up approximately 25 by 80 Greenhut's 1,000-pound cars up approximately 25,000-pound miles a year at a cost of 5½ cents a miles in or 25,000-square miles in or 25,200-square miles in or 25,200-square miles in or 25,200-square miles in or 25,200-square miles and 25,200-square miles miles and 25,200-square miles miles and 25,200-square miles miles and 25,200-square miles miles miles miles and 25,200-square miles 8,300 miles at a ton-mile total of 10.65 cents

Generally speaking, the 1-ton truck will do 80 miles a day at a total ton-mile cost of 20 cents, or \$8 a day, while a 1-horse wagon will cost \$4 a day and do but 22 miles (maximum), making the ton-mile cost 86 cents. Moreover, these figures show that in mileage covered, the former is equal to 3.68, or since a horse cannot 18 equal to 3.05, or since a norse campo-be divided, 4 1-horse outfits, which at the \$4 a day figure, would amount to \$16 a day. Hence, the motor shows a saving of about \$12 a day on equal mileage requirements.

However, cost alone is not the decid ing factor in the department store's gradual, but very certain adoption of motor trucks, that is its quickness of action. allowing of rapid delivery or as it is usually termed, more prompt service, an extension of available territory and a lowered cost being the secondary deciding factors.

#### Motor Truck Queries and Answers

horses and 150 wagons. In the comparison, several points will be noted, primarily the much greater proportion of Paris. How many are there in this countries the Wanamaker countries. try, and why are they not generally used here as abroad?

> A. The largest and oldest motor omnibus installation in this country is that of the Fifth Avenue Stage Company in New York, which is now operating close to one hundred vehicles. There is a line of four or five running on one of the principal residential thoroughfares of New Haven, Conn., which is nearly as old. A company began operations in Chicago last fall and now owns about a score of vehicles, while another has begun in a small way in Indianapolis. There are a large number of motor stages of various kinds in use throughout this country, and these might e classed as omnibuses. The total number is small, however, compared with the something more than half this number in

> Among the reasons which undoubtedly explain why motor omnibuses are not generally used here as is the case abroad, is the fact that all types of commercial motor vehicle are of more recent origin in this country than in Europe. Other passenger transportation, particularly the electric street car, have been more highly developed in American cities so that there is not the same need for motor complements. The inferior street motor omnibusses. The inferior surfaces and the difficulty of s franchises are other contributing factors Passenger transportation in competition with street cars and interurban trolleys is one of the most promising fields which the future holds for the commercial motor vehicle in this country.

> A. J. B. asks: Is motor truck travel unusually hard on stone roads, tu com parison with pleasure car and horse traf-fic? What is the best kind of road surface for motor truck travel?

> A. Your questions repreas yet unsolved. When motor trucks are over-loaded and over-speeded and unfortunately this is the rule rather than the exception, they are harder on roads than pleasure cars. When road surfaces begin



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of the Railroad Wre Westport

(Concluded from page and)
like action it lurched over to the right
and was in this position when it enters
the second half of the crossover. Rat Wat reaction of the curve on the flange of the wheels caused the engine to continue heeling over to the right until equ librium was entirely lost. The whee flanges (see small sketch) lifted clear of the inner edge of the rail, and the engine shot straight ahead for seventy to eighty feet, lauding on its outer right-hand wheels upon the ties on the outside turnout to outer track of the siding. . When the writer inspected the scene of the wreck, he found there was not a single scratch on ties or rails throughout the whole crossover. Now the centrifugal force develope

against a curved rail is inversely propriorate to the radius of that curve. The longer the radius, the amaller the cen-trifugal force. It is perfectly possible (though, of course, more expensive and requiring more careful workmanship) to make a crossover so long and its curve ture so easy, that the centrifugal effect, even at sixty miles an hour or more, will not imperil the safety of the train. The facts are well known to ratiroad engineers, and of late years our best railroads, those which are sincerely desirous to do everything possible to render railroad travel safe, have been taking up the short crossovers laid down in an earlier day and substituting others of a safer type The New York Central uses, under condi tions similar to those at Westport, a No. 18, the radius of whose switch rati is 2,521 feet. The Pennsylvania Railroad Company uses a No. 20, with a radius of 3,442 feet. The Westport No. 10 has a radius of only 942 feet. Consequently, had a New York Central crossover been in place at Westport the centrifugal force would have been not much more than one third as great, and with a Pennsylvania No. 20 in place, it would have been not much over one fourth of that develope by the wrecked train. The New York Central Company has a speed limit, we believe, of forty miles per hour for its No. 18, and the Pennsylvania Railroad imposes no speed limit on its No. 20, the curvature being so easy as to be safe at any speed at which the train can be run.

Furthermore, in showing how well this matter is handled by roads whose officials are sincerely desirous of doing everything. both in the physical construction of the road and in the maintenance of strict dis , to safeguard its pass should be mentioned that on the shorter crossovers on the Pennsylvania lines on which speed limits are imposed, tests are made at regular intervals of the speed a which engineers run over them. The engineers do not know when such tests will be made, and a violation of the rule meets with instant punishment.

The SCIENTIFIC AMERICAN COMM these facts to the serious attention of the general public, and expresses the hope that in the forthcoming legislation which will undoubtedly be the outcome of the Interstate Commerce Commission'
vestigation of this matter, the cor vestigation of this implier, too constitution in their representatives in Congress that they wish the recommendations of the Commission to be embodied in early and drastic legislation

sian Military Flying Machines eroplanes which will take hoperment on THE aeroplanes which course in Russia are sincet; entirely of home construction. The entries were closed on August 226, and it is thought that at least 180 planes made by Russlan de planes made by Spinish density will take part. A merica of the outside the official serious will form: part of the programme. the Bussian pilot, Abrasion recently made a light on in Wright biplane from Bussia Patemburg, is to talks pu-acts that a Bolland country



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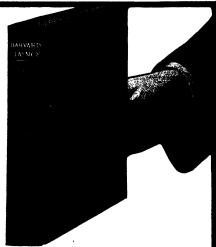




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VOLUME CVII.

The first shows the 12-inch projectile, just beyond the gases, about 50 feet from the gun. The a was actuated electrically by means of the projectile.

THE DISCHARGE OF 12-INCH GUNS .- [See page 365.]

# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, NOVEMBER 2, 1912
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Munn & Co., Inc., 361 Broadway, New York

The Editor is always giad to receive for examination illustrated articles on subsects of timely interest. If the photographs are sour is the authors short and the facts authoritie, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Our Panama Canal Number

ROM the time, some ten or twelve years ago, when the construction of a Trans-stamman Ganal by the United States began to be seriously considered, the Nurnyiro American has devoted much attention to this great national enterprise. Mainly on technical grounds, we were an earnest advocate of the construction of this cannot at Pansum, having foreseen the great engineering difficulties and the subsection of a cannot at Nicaragua. The progress of the work at Pansum has been a prominent feature in this Journal from the time when the cannot wan taken over by the United States from the French Construction Company, and this menumental work has formed the subject of frequent illustration, description and

It gives us much pleasure to present in the next insure of the SCRITTIFA CHRISCAN a fully Illustrated description of the Ivanama Canal, written by members of the istemina Canal Commission and by the various technical officials who have been in charge of the work. Recense of the fact that the articles are written by the men who have been in charge of the work, this number will have particular value, authority, and interest to our readers. Many facts, authority, and interest to our readers. Many facts, output of the work of the comment of the work of the

The Pannan Canal Number will open with an article by Jesteinani-Cloudel Stelect, of the Corp of Englishers U. S. Army, who has had charge of the construction of the great triple-flight locks and the huge dam at Gatus, which constitute in themselves a work of a magnitude numpressed in the history of hydraulic engineering. We have all heard much about the great Culebra cut through the mountain divide and of the enormous sildes which have developed during the progress of excavation. This subject is hundled in a clear and comprehensive way by the army engineer who has been in charge of the Culebra Cut for the last five and one half years, Lieutenant-Colonel D. Hulllard. So excellent have been the organisation and the efficiency of the plant and methods of excavation and transportation, that, although some twenty-two million cubic yards of silden have come down into the Culebra card during constantiating estimates of the Culebra card during constantiating estimates of cost—a root during constantiating estimates of cost—a root of which Gol. Galillard may very justly we remove

It is very well understood by everyone who has eren thought about the Pannan Canal, that its construction would have been impossible but for the fact that the two great securges of the Isthmus of Panama-yellow fever and mainta-have been either completely exterminated or thoroughly controlled by the Sanitary Pepartment under Col. Gorgans. This subject is treated in a very readable way by Dr. Orenstein, one of the members of the staff under Col. Gorgans.

With the near approach of the opening of the Caual, the question grises as to its future commercial value to the United States. We have been fortunate in securing an article on this subject from a member of the ishmian Canal Commission, Prof. Emory Johnson, the expert statistician of the caual. Prof. Johnson shows the "article" wisht "art Chie Tyrinchpal trade routes of the world, how they will be affected by the opening of

the canal, and what are the reasonable property, attracting to the canal a larger and paying properties of this trade

of this trade. When the casel is opsaid, electricity which during the past two decades has unleved so largely into all great constructive work and the operation thereof. Will become the all-but-undwareal motive power in the operation of the great waterway. This subject will be treated in a comprehensive manner by one of the leading engineers in the field of abertical engineering.

#### A Coming Profession

O far as our knowledge goes the city of Sumter \$8 \times 1 is justified in claiming that it has introduced "in ewe and coming profession." Through the secretary of its Chamber of Commerce, that emprising community of ten thousand people has an nounced that applications will be received for the office of city manager of Sumter From the brief summary of the requirements for this office, we gather that the applicant should be completed to oversee public work, such as paving lighting water supply etc. that an engineer would be preferred that he must state what has been his previous experience in municipal work of the complete administrative control of the city subject to the approval of a board of three elected commissioners, and that he will hold office so long as he gives autifaction to the commissioners that his work will be purely that of an expert and that he will be entirely free from political control finally although local conditions and tradition will be taken into censideration local citizenship will not be necessary.

The amouncement concludes by designating this as a "A splendid chance for the right man to make a record in a new and coming profession, since this is the first time that a permanent charter position of this sort has been created in the United States. If the last statement is correct, the SCHEPTICE AMERICAN CONGREGATION beneficial results in the orderire AMERICAN congratualities the little city on having inaugurated a movement whose beneficial results in the orderiry economical and right cours and administration of municipal affairs will make themselves increasingly appears.

#### Supply and Demand in Motor Fuels

IIIE question of an adequate supply of gasoline for internal combination engines in again become mother than the control of th

other hydrocarbons than gasolins.

The suggestion is not new it has been discussed time and again Bennoi alcohol and kerosene have been tried and found wanting—in the carbursters used for gasoline engines. The fault was not with the fuels, but with the onchureding devices employed Excepting for the apparent relocations of manneautrees of motor cars to provide the small extra equipment necessary to attain this destrable epd there is no reason whatsoever why kerosene or henzol should not make highly satisfactory fresh for the automobile motor Nearly every gasoline tank has an energenty tank built in Why could not this tank be used as a starting tank and the main compartment be filled with kerosene? The carburster adjustment for kerosene is slight a mechanical air valve could be attached so as to supply the mixture with more crygen than is necessary for running with gasoline. The carburster is cluded to the could be water jacketed or otherwise watmed, so as to facilitate gastifuing of the fuel, as is done in many cases even now.

as one of the officials of the Standard Oil Company recently explained to the writer the whole trouble with the gazoline supply of this country is not at all in the supply of crude oil but in the inability of the refiners to get rid of the kerosene and other heavier feels eltaised in the process of distillation. When kerosene was used in households to a manch greater extent thân at present, the gasoline—then an almost uselees by product—was sool at tridiculously low prices. Now the positions are reversed gasoline sells for a high price because it finds a ready market at my time while kerosene is the or arbitrary of the comment that manner than the company of the company of

the country is settled fully and with denied with the seal for desiring. The matter the obtainty with the conjugacing dericals and their

#### Achievements in Aviolina

HE winning of the Interestings (the Section Chicago two months side & Telegon two months side & Telegon two making of a single circuit of the Self spile as head, and it making of a single circuit of the Self spile circuit of 000 miles as head of the self-spile position ances accomplished of into by Franchesen in the Self spile spile of a visition.

Besides the remarkable long finishmen lighter from Paris to Bottle and from Antwenp to These than have been made by Frenchmen, they have side the than been made by Frenchmen, they have side the program of the control of the control

Without an 20 More-power monopless shiller to Wolfows? Depardment (which was of but it 50 home-power) it would take only three fifths of the line that Fourny remained about to fiy from New York to Chincago I in other words, tes hours could be out from the time required by our fastest express trakes to ran from one metropolis to the other. The preduction of such a commercial machine is a comparatively size him, the first thing he would be set sized that were he able to come to this country and sudgish lesses for thim, the first thing he would be would be to fereign a commercial speed monoplate and start at at it like for passenger traffic between the show mentioned

After having constructed a powerful Bleint ponopiane especially for quick climbing. Boland Garba succeeded, on September 6th in breaking all records for eached. The previous record made by the Austrian army officer Blaschke. But Garrow scalpreast of his army officer Blaschke. But Garrow scalpreast of the proceed was not four long, as only five days later, travelled Laggment. Who had previously despored to the control of the condition of the control of the control of the condition of the control of the control of the condition of the control of the control of the record of the control of the control of the condition of the control of the control of the hours of the control of the control of the pre-manufacture of the control of the control of the pre-manufacture of the control of the control of the pre-manufacture of the control of the conlable of the control of the conlph of the control of the conlph of the control of the control of the conlph of the conlph of the control of the control of the control of the conlph of the control of the control of the control of the conlph of the conlph of the control of the conlph of the conlph of the control of the co

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#### Electricity

The Preduction and Consumption of Copper.—It is succlusted that the consumption of copper runs parallel to that of iron, and statistics show that the world's use of the se-salled "red matal" ranges from 334,656 tons for Anisates (the chief consumer) down through Germany, Great Britain, France, Austria-Hungary, Russia and fully to 42,000 tons "for other countries." The production has showt tripled in the last twenty years.

New Plant for Making Aluminium.—Aluminium is to be turned out at the rate of 25,000 tons annually at a new hydro-destorie manufactory now under construction in North Carolina. Power will be supplied by seven vertical subserviewel type electric generators of 5,000kilowati capacity, the largest ever built for generating direct current, together with several smaller machines. The enterprise has been financed in France and the work is no charge of Dr. R. Heroult. The plant will be the largest in the country, except one at Niagara Falls, and it will be completed by the middle of 1918.

Based as a Dielectric for Wireless Telephone Conclassers.—A Japanese investion is announced designed to overcome the well-known electrical and mechanical difficulties experienced in the use of glass-plate conclassers in wireless elegraphy, especially on board ship. Brush discharge as the edges of the giant plates which the criticality reduced by variabilities at the edges of the plates, is more effectively checked by a flexible, nongrituding contains of enamed of high familiation resistance and discourse to example the plates and discourse over the plates.

Cadasum Alley Vapor Light.—Many attempts have been made to improve the mercury vapor lamp, which gives a light of high electrical efficiency but is disadvantageous for some purposes on account of the greeniah color of its light. A German inventor now announces two forms of metal-vapor lamp giving a white light by an allay of sedmium with a small percentage of mercury. One form has a graphite annote and a mercury and cadmium cathode, and the other has both electrodes of the cadmium and mercury. The latter lamp is claimed to have an efficiency qualt to that of the pure mercury vapor lamp. A poculiarity of the new lamp is that the active material, being solid at ordinary temperatures, becomes deposited on the walks of the quart tube as the lamp cools after the current is turned off. This action gives no trouble, however, as the deposit is vaporised as soon as the current is switched on again.

Power Dissipating Rheestal.—The dissipation of large amounts of energy in electrical testing work by means of rheostats becomes a serious problem on account of the heat generated, and special means of cooling the rheestat must be provided. For testing a large storage battery at 8t. Louis, requiring the continuous dissipation of 1,500,000 watte of energy, the duvice was adopted of using iron pipe as the resistance conductor and of cooling the same by circulating water through the pipe. A total length of 380 test of 2-inch pipe was used, made up into a grid which was tapped at several points to allow the water to escape without having to pass from end to end of the grid. In the use of this rhoustat the 5,100-ampere discharge of the battery was astisfactorily dissipated during the rated one-bour discharge by 1,310 cubic feet of circulating water, although it was found necessary to quanch local hot spots in the pipe by playing out them with a loce.

Lead Dispatching on a Great Central Station System.—In certain large and complex describedy apply systems, where current generating especity is so great that serious damage might easily follow a mistake in cleding writches or in making feeder connections, a boad dispatchies" is employed. This official has in his office a large ping panel or board representing circumstationally the entire generating and distribution green, every high tenson (cell) savitoh, feeder and the line being shown "in little" so that the dispatcher can follow out any given circuit easily and quickly. The pilos impace on the oil switching is cell important on the same and the

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#### Science

The Cisemategraph in German Schools.—The German Ministry of Education proposes to introduce the use of the cinemategraph in various courses at institutions of higher education. Films for courses in anatomy bloogy and bacteriology are already available in Germany. A leading philanthropist has presented two fully equipped moving-pleture machines to the schools of Berlin, one of which is to be used in the higher normal schools and the other in the high schools.

Schaumasse's Comet.—The new comet discovered by Schaumasse of Nice, France, on October 18th, was discovered independently by Dr. W. R. Brooks of Geneva, N. Y., on October 20th. A cablegram from Klei states that Fayet and Schaumasse announce that the elements of the comet are nearly identical with those of Tuttle's comet, discovered January 4th, 1868, at Harvard College Observatory, and later shown to be identical with Meshain's comet, 1769, II its period is about fourteen years. It was observed in 1871, 1833, and 1894

British Gasoline Fire Tests.—The British Fire Prevention Committee, at the opening of its autumn session last month, carried out a lighly important and interecting series of experiments with a foam extinguishment. The foam, which is created by chemical means, was thrown upon burning saodine, rauging in quantity from a mere bucketful to a flooded besement in which firty gallons had been spilled. The tests are said to have been highly actiatedory and were watched by representatives from the several government department. Members of the military aviation department also were present

Bay. Waiter William Sheat, who died on Ontober 7th, was a tower of strength in English philology, and his place will control to the Sheat of the She

A Status of Capt. James Cook, the navigator, the git of the Hom. Gervase Beokett, Mr., to the town of Whitby, was unvoiled at that place Octobe 2nd. In referring to this event the English journal Nature reminds its readers of the fact that Cook sarned the gratitude of the world not alone as an explorer, but also as the first person to take selentific persentive measures against sourry on shipboard. In so doing he contributed greatly to the success of natulated explorers who came after him. When he returned from a three years' voyage in 1775, he had fost but one man in a crew of 181. This schlevement seared him unanimous election as a fellow of the Royal Scolett.

Capi. Kech's Journey Acress Greenland, the plans for which we have previously reported, was successfully begun during the past summer. A remarkable bit of preliminary training was carried out by the party, which while visiting Iosland in its ship, the "Godthash," moder to prouce Iosland points for the sledge journey, made a brilliant dash across the island, from south to north, scaling the highest point of the inland iscenp, viz., Orretajötull, a feat which had been accomplished only once before, by Lord Watts, in 1875. The party sailed north from Akursyri, Iceland, on July 6th, and effected an easy landing at Cape Binnarck, on the far north-eastern coast of Greenland, July 21st. This would have been impossible in the summer of 1911, when the ice conditions were very unfavorable. Capi. Koch exposts to cross Greenland at its wiedst part, reaching the west coast some time next year. He is accompanied by the German metsocologist, Dr. Alfred Wegener.

The Northeast Passage.—No less than three expeditions are now under way, or in preparation, with the object of making the Northeast Passage around the object of making the Northeast Passage around the Arctic coasts of Eurasia; a feat that has not been accomplished above Nordenskipld's successful journey of 1875-70 in the "Vega". Two of them have already been reported in these columns, vis., that of the two Rostania los-breakens, which were to sall from Vladivestok least summer's and the slaborate German expedition under Lett. Behydder-Strange, which is to lever from the European side in June, 1913, and spend about four years merchantage as route. It is now stated in Peterson, William as well as the present the second of the Strange Stranger of the Stranger of the Stranger of the Stranger of the Stranger with their the route taken by William Young in his journey of 1875-70 in quest of William Young in his journey of 1875-70 in quest of William Formation of the Stranger of the special color of the Stranger of the special color of the Stranger of the expedition of one of the Biberga river; probably Entatages, It is expected the defrap part of the expension of the expedition by lumning and fashing and by tumed with the nature.

A Committee

#### Automobile

Self-illuminating Car Paint.—The latest in automophants somes from England. One of the largest firms there has just brought out a new variish, called "Lumino Aluminom Paint," and it is stated that the glow of the paint on a dark inght is so bright that the car is visible for two miles, without being fitted with lamps. People on the reads near the factory at first were frightened to death by the strangely glowing, lightless care, which silently submired through the village.

Eight Patents for Hinged Vehicle Hoods.—Traugott Golde has secured patents numbered from 1.034.899 to 1.034.906, inclusive, for hinged vehicle hoods comprising an arrangement of bows for supporting a hood or top of the automobility pie in such manner that the tops are supported from the rear portion of a car and extend thence forwardly over the front seat. In the earlier filled applications Mr. Golde appears as from Gers, Germany, while in the later applications his address is given as Passaio, N. J.

Armor-plated Cars for Italy.—The Milan automobile of the so opened a subscription to provide the war department with armor-plated automobiles for the operations in the Tripoli region, and these are to be made according to a special design, carrying light cannon and also mitralleuses. Engineer G. Galli has now gone to Tripoli no order to organize the automobile service, as there are now considerable funds received, so that it is expected that the armored cars will soon be orousing the desert, manned by the best officers of the engineer and artillery

Handy Combination Lamp.—A combination automobile beadight and movable hand lamp has just been placed on the market. It comeants of a silver-aluminium casting about 3/10 of a inoli in theichness, ground on the inner surface to a mirror-like polab. The socket of the electro lamp fits in the reflector in such a manner as to be easily removable by a simple turn of the socket to the left. The long flexible cord attached to the socket readers it variables as "trumble lamp" reaching to all parts of the car. The removable socket also permits of using varpowered bulbs for use in city and country driving.

Montreal Forbids Steam Trucks.—At a time when removed effort as being concentrated on a stury powerful steam truck, which has been demonstrated in Detroit and in Nyaok, N. Y. the city of Montreal Can, making an attempt to legislate the steam truck and tractor out of business. The city council has just passed an ordinance forbiding the use of steam-propelled commercial cars on the streets, but permits the ordinance is particularly aimed at the lings steam tractors with their trailers, which are used in England and which are in evidence in the country districts of Eastern Canada.

Trouble With Initials.—Considerable trouble is experienced in Europe with the custom of abhreviating the extraordinarily long names of some of the ears, by using the initials only. There is a S. C. A. R. our made in France, the initials only. There is a S. C. A. R. our made in France, the initials in case has care representing. "Sossific do Construction Automobile" (then follows the last word, Turnio, Parissenne, or whatever it may be). The newspapers and magazines, especially, are "up in the air," respectively gridge credit to the wong car, and even perpetuality gridge credit to the wong car, and even perpetuality are represented by gridge credit to the advertisements put out by the various companies.

How They Do It in Germany.—In oducating police magistrates and prosecuting attorneys in the rudiments of automobile traffic requirements, so that they may be able to handle intelligently the many cases of traffic violations, the Berlin justices of the lower courts and their "Btastsanwselts" were taken on a tour of the city in automobiles applied by the Imperial and Berlin Automobiles (Clubs During this tour, which lasted several days, and which penetrated into every section of the big city, the cars were driven at all rates of speed and the passangers were given all opportunities to test in their own persons the effects of Berlin's traffic regularities.

Carbureter Attachment for Slow Engine Speeds. —
An Engilsh firm has just brought out a carbureter attachment which will enable the chauffeur to keep the engine running, while the ear is standing still, at an exceedingly small expense for gazoline. The device consists of a small fitting, containing a munit get and air inlet soldered to the inlet pipe, between earbureter and engine, and a small pipe connecting with the float chamber. An adjustable needle valve is supplied to edigist the quantity of gas and are required for slow and silent running. The action of the device is entirely automatic. On shutting the man throttle, he vacuum in the inlet pipe increases to such an extent that the small auxiliary jet comes into operation, the gas muture being regulated by the position of the needle valve. When the throttle is opened again, the suction decreases and no gasoline is drawn up to the auxiliary jet, which is at a higher level than the main jet.

## Electricity and Spray Irrigation

#### How Water May be Raised by Electric Pumps to Produce Artificial Rain

By Putnam A. Bates, E.E.

PALATRICITY for lighting and power is rapidly be advancing in the favor of the American farmer. Whether he be one of those adventurous individuals who stake their all on the prospect of developing a paying farm in the arid districts of the West and Southwest, or in the swamplands of the South, or whether he is of the class that is turning its attention

to the great rewards of truck and dairy farming in the East, the modern farmer has caught the scientific spirit of the time and be getting practical results from his realization of the fact that methods must accommodate themselves to changing conditions

At Bridgeton, New Jersey, Charles F. Senbrook Is farming with twenty-five acress under trigation, and he usually gets from three to four crops a year from each piece of ground. The crops ruised are lettuce, celery, parsley, carrots, cabbage, beets, onlone, leek, and practically every kind of truck a vegetable gardener would grow.

The method of trigation which Mr. Sonbrook employs is shown in Fig. 1. While not new, it is quite different from the methods with which we are more familiar, that have become so stamped upon the mind of many not especially posted as to lead them to regard water "ditches" and "irrigation" as indicating synonymous conditions. The idea is to reproduce a gentle rainfall, insuring uni-

form distribution of water, under control. The application of the water is in the form of a fine spray, which settles that the soil, and does not remain on the surface. The pipes run horizontally across the field six feet in the nir and are fitty feet apart. Every four feet a nozzie is inserted in the pipe from which for the first properties of the pipe from which in the first properties of the pipe from the first properties of the fine that it does not pack the soil as a heavy rath.

It is a noteworthy fact that for every pound of solid manner added to a plant by growth, it is necessary that several hundred pounds of water be taken up by the plant and evaporated through it into the atmosphere That indicates the importance of the proper means of furnishing the water supply to the plant. With this fact in mind, it is impossible to understand the reason why the crops secured from proper irrigation yield results which seem unbellevable to many growers.

The difficulties encountered in many methods of irrigation are the initial cost of installation, the difficulty of securing a satisfactory uniformity of distribution, the waste of water and the excessive labor and expense involved in trigation.

involved in irrigation.

The most familiar method of irrigating a considerable area is the ditch system. In many localities the character of the soil renders the use of the system impossible but, wherever used, it is wasteful in the use

of water. And with this system it is difficult to approach that uniformity of water distribution necessary to produce an equal growth on all parts of the acreage irrigated. The cost of labor involved in this method is high, and should a heavy rainfail follow the Irrigating damage is apt to result. What is known as the deluge "system" is an overhead distribution system.

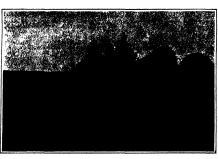


Fig. 1.-Irrigation in the form of an artificial shower.

tem sometimes used, in which circular lawn sprinklers are located at regular distances over the field, the water being supplied to them by pipes. The objections to this method have been two-field. First, it is impossible to secure a uniform distribution of the water, for the reason that between the circular areas watered by the sprinkler there exist dry spots which do not receive a sufficient amount of water. The second objection is that the water as applied to the ground has the same effect on the surface soil as does a beary rainfall, resulting in heavy increstation of the surface, interfering with the sir supplied to the roots of the plant, thus relarding the growth, and necessitating additional cultivation. The expense of this system in its first installation is excessive and the results are unsatisfactory.

On small areas the makeshift method of watering by hose is used with reasonably good results, but it is only a makeshift and requires too great a labor cost to be considered for anything more than a small patch.

It is impossible, therefore, to water uniformly and without materially disturbing the proper mechanical condition of the surface soil unless we follow a method the application of which will approach the conditions under which a gentle rain or mist will fall upon the ground. The method which is here shown accom-

plishes this, and it is without question beneficial in truck garden work or on other areas of fertile sofi where the forcing of crop growth is undertaken.

In the kind of farming that is being taught to-day we must plan for a full crop every year—not every other year, or, every third or fourth year, as so often happens in the humid sections where the land is neither

humid sections where the land is neither drained nor artificially watered, but where thirty to sixty-day droughts occur with considerable regularity.

There is so much comparatively inexpensive land surrounding all our large cities that it is well to lay stress on the methods by which such areas may be made more productive.

On a demonstration plot where the spray irrigation was employed an acre and a haif of this farmer's strawberries yielded over \$200 worth of fruit after non-irrigated ones in the same field had count to bear for the senson.

coused to bear for the season.

Irrigated onlows yielded at the rate of 4828 bushles her acro, the bulbs taking first premium at the fatr for quality. This onlon crop received during its growth 3.04 inches of water by Irrigation and 5.77 inches by rainfall. But the rainfall fatted to do its duty, as the bulk of it came in one large cold storm and the balance in eleven small uncless showers. Irrigated raspherries responded with a ten days longer bearing season, and much more thrifty cames than non-irrigated.

The manner in which the water shall be con-

vines. The manner in which the water shall be conveyed from its source-stream, pond or underground flow, to the distribution system adopted is a problem that merits an careful analysis as that applied to the question of spreading water upon land.

In any case pumping is an essential except where nature provides conditions of gravity flow. The usual sasoline engine-driven pumping equipment is shown in Fig. 2. Oftentimes it is necessary to use an internalcombustion engine for irrigation pumping, but in the last analysis, where electricity is available the motordriven pump offers, in case of control and convenience of application, the best conditions yet devised.

Fig. 3 shows a small electric Irrigation pump, and with such it is possible to introduce in the installation a storage tank under air pressure which will supply the water through the system of overhead sprayers at a sistred 'head," and at the same time the operation of the electric motor may be entirely automatic, no attention whatever being required for either stopping or starting. And from an entirely different point the water supply to the distribution system may be controlled or regulated according to the needs of the crops which are under irrigation. Lastly, on a basis of reasonable cost for electric current, pumping by means of this form of energy is cheaper than with any other.



Fig. 2.—Where electricity is out of the question a gasoline motor will pump water for irrigation.

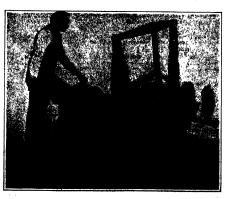


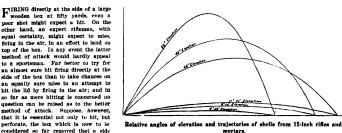
Fig. 3.—Combined electric motor and pump, controlled automatically or by

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#### Mortar Fire

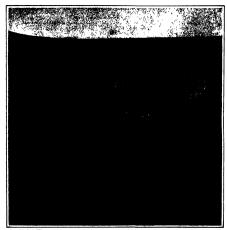
#### A System for Attacking the Decks of Battleships

By Charles A. Junken

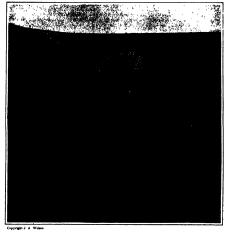


mortars.

tance of flight of any object launched in air, under similar conditions, depends entirely on the angle of elevation. The propellant force remaining constant and conditions normal, the range depends solely on the angle of elevation at which the given object is projected. This is alike true of a baseball thrown by an equally strong arm, a football punted by an equally strong leg, or a bullet of cettain dimensions and weight propelled at equal velocity from a firearm. For at equal velocity from a firearm. For any given set of conditions an angle of projection of about forty-four degrees and twenty minutes will result in the greatest possible range. Roughly speak-ing, this is an angle of forty five degrees, and this angle is adopted as the lower limit of elevation for mortar fire.



Photograph, 1/5,000 second exposure, showing shell issuing from m white ring is gases that have escaped past projectile in the bore.



The mushroom-like burst of gases from muzzle immediately after the shell has left the mortar. Taken an instant later than adjoining photo

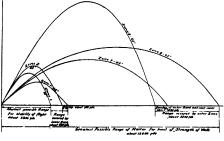
sheathing of metal results in the flattensheathing of metal results in the flatten-ing out of all bullets fired directly at it. The top and bottom of the box remain-ing unprotected, the lld offers the only hope of successful attack. The rific-man is thus forced to resort to a method known as "indirect" or "high angle" fire as the only chance of successful at-

tack.

The box thus described is an illustration of the target presented by a modern battleship or heavily armored cruiser. In-kroadside this is so heavily sheathed with protecting armor as to well high invulnerable, at even modbe well high invulnerable, at even mod-erate ranges, to the attack of the most powerful modern "direct-fire" guns. In deck armor it is rather weak and en-tirely at the mercy of the "indirect" fire of a modern mortar. The relative thickness of side and deck armor is illustrated on the next page.

Because of the only remaining chance of successful attack the mortar advoof successful attack the mortar advo-cate will obtain a most respectful hearing if he can but develop a tendency to hit. If it be required of him, he can pleed the additional argument of economy. Owing to the weak deck armor be is called upon to perforate, his gun is short, for he requires but low velocity to attain long ranges. Projectics are big be-cause the walls of the mortar can be handly made

Hillian har the the think in the



Zones of fire of mortar batteries.

thick and strong enough to withstand the pressures developed by the relatively small powder charge required to accept a big projectile to a considerable range, and the very fact that small charges of powder are required, makes for economy in every round. The relation of the results and revides above. are herewith illustrated. The ranging effect or disBoth above and below this angle of projection the range decreases till, on the one hand at dead level, and on the other at the vertical, the range becomes zero. This is illustrated in the paths of flight herewith shown. From the dead level or zero elevation to forty-five degrees, every possible range within the power of the firearm is attainable, and the same is equally true from forty-five degrees elevation to the vertical. But the theoretical possibilities thus developed are vastly prescribed in practice. As has been pointed out, direct-fire guns are limited to the range at which their projectiles can perforate heavy side armor At the comparatively low angle of fifteen degrees this limitation is reached. even at normal impact, which is, of course, quite exceptional, since it means flat broadside exposed to attack, which rarely happens

At present writing it is well assured that the best armor-piercing shot fired

from the most effective direct-fire gun is impotent on the present side armor at ranges consequent on angles of elevation about fifteen degrees. The velocity is so greatly reduced by the resistance of the sir that the remaining momentum of the projectile merely serves shatter it helplessly against the heavy side armor of the target. Direct fire has to-day a sure limitation

SECTION DESCRIPTION OF THE PROPERTY OF THE PRO

of lifteen degrees, and will have for some time to come The limiting angle for indirect fire or mortar fire is likewise restricted, but from a very different cause.

At angles of elevation above sixty-five degre time of flight becomes so great as to be prohibitive, and this marks the limit for the highest angle of mortar fire. There are other considerations involved in the strength of carriage and irregularities of flight above this angle, but these are subordinate to the unavoidable objection of excessive time of flight.

Of course, it is understood that to make a hit, it is essential that moving target and flying projectile arrive at the same spot at the same instant. In firing at a maneuvering battleship the element of time of flight thus becomes a most important factor, and it will be readily admitted that the time the projectile is in the air should not exceed one minute. By changing course and rate of speed, the commander of a man euvering ship, in such a long interval of time as this can readily place her at other than the predicted or anticipated point where she is expected to be when the shot strikes. This limit points, at the outer range to an angle of projection not exceeding sixty-five de-grees, since at this angle it takes the projectile over a minute to perform its path of flight.

It is a peculiar coincidence that with limiting restric-

to a peculiar connections under with imming restric-tions so widely divergent, the scope of angles of pro-jection is about the same. The total change in eleva-tion for direct fire is limited to fifteen degrees, and that for mortar fire to twenty degrees. These limita-tions of the upper angle thus prescribed place a great restriction on the attaina range. On this account it has been necessary to resort in mortar fire-to what are called "zones". It is, of course, essential to cover every yard of range between the outermost and inner most limits of fire.

At a maximum velocity, within the power of the gun, behind a given projectile, the maximum range is at tained at forty-five degrees, but the minimum is not attained at sixty-five degrees. The only way to get less range after this angle is arrived at is either to the powder charge or increase the weight of the projectile, or both.

Since the longest ranges are of little value, on account of the inherent inaccuracies, it was decided in Uncle Sam's service to build a mortar only strong enough to carry the heaviest projectiles to moderate ranges. A comparatively light projectile was designed for the outermost zone. With this projectile a certain portion of the total range is covered. The limits of this lighter projectile of 824 pounds weight are between a maxinum of about 12,000 yards for forty-five degrees, to a minimum of about 8,700 yards at sixty-five degrees

An approaching battleship is fired upon by mortars at the outermost range, and finally arrives at safe anchorage on account of the limiting angle of sixtyfive degrees elevation, which results in the shortest possible range for the mortar under the restriction possinic range for the mortar under the restriction formerly adverted to. Allve to this situation, the mortar man employs a heavier projectile of 1,046 direct-fire gun; and so reduces his powder charge as to attain the same or but slightly greater range at his lesst angle of forty-five degrees with this projectile

than was previously attained at sixty-five degrees clevation with the lighter one. tion with the figurer one. He thus establishes a sec-ond zone of fire that will last him till the enemy once more arrives at the angle of safe anchorage, as it may be called, of sixty five degrees. Once again the pow-der charge is reduced so that the angle of forty-five degrees will result in range but little grenter than was previously attained at sixtyfive degrees. So on, by suc-cessive reductions of charge, the range is shortened will successive zones of fire till the minimum limit is

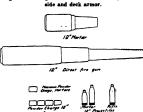
The limiting range is for an angle of sixty-five de der charge that will result in stability of flight. Stability of flight means that in spite of the low limit of velocity and the limiting twist of the rifling of the bore of the mortar, for high velocity, the gyroscopic ac tion of the elongated projecshall still be sufficient to keep it steady in flight.

The wobbling of a spinning top that is dying out is an illustration of the effect that is too low velocity might have on a projectile fired from a gun. There is danger of the projectile "tumbling."

To give the mortar crew time to change the powd charge from one sone to the next, a certain "overlap" of zones is provided. The next lower powder charge is so prescribed that at forty-five degrees elevation range will be somewhat greater than the charge next above at sixty-five degrees. To meet all these requirements, eight sours of fire are prescribed and the conditions met are herewith illustrated.



Diagram showing relative thickness and position of



Relative sizes of direct and indirect-fire guns, powder charges and shells.

With such complications involved, and in considera-tion of the fact that the mortar crew is hid behind protecting parapets and does not even see the moving cked, results are marvelous. in recent firings obtained seven hits in eight shots at a range approximately 10,000 yards, or nearly six miles.

That all difficulties have been met and overcome, in
the construction of a range table and adequate method of correction for abnormal conditions of atmosphere, wind, and travel of the target, that will give a mortal wind, and travel of the target, that will give a mortrar crew a fair chance of a hit, is an achievement in which the servants of Uncle Sam, who are responsible for this accomplishment, find a solid degree of satisfac-tion. In no foreign country has so great a measure of success been attained by the methods of mortar fire.

The accompanying photographs are most interesting

illustrations of firing by methods of direct and indirect The principal interest attaches, how in which the projectiles have been caught in flight. the direct-fire picture the projectile is plainly visible, just beyond the expanding gases of combustion, flying forward at the slight angle of elevation requisite to

give it the long range it will attain before give it toe one range it will scream, encode it graines. The morter projectile is shown at the intensor besides its exit from the bore. The clouded ring that par-tially envelops the projectile is the result of a shight escape of gas beyond the projectile before it was fairly seated in the rising of the bore. The next pions graph shows what happened an instant later in a late

These photographs were recently taken under the supervision of the Department of Embraded Specialists, Coast Artillery School, Fort Monroe, Va. The camera is actuated electrically, by means of the projectile in the case of direct-fire guns, and by the receil of the top carriage in the case of mortars. Time expounrs in both cases was about one five thousandth part of a second. These photographs are copyrighted and per-missions to use the same for this article was obtained.

#### New York State Education Building

By J. A. Stewart

THE beautiful State Education Building, de At Albany, N. Y., last month, is the only edifice of its kind in this country or abroad. It is of classical design, built in white marble, terra cotta, and dark granits. The façade consists of a Grecian marble colonnade resting upon a proper and powerful granite stylobate. This huge marble colonnade stands out well from a wall pierced by a series of large semi-circular openings which allow great window area and produce a secondary architectural effect. The colonnade sup-ports a beautiful attic and cornice. The roof is of copper, the caves being decorated by a carved che The rear walls are of light-colored vitraous brick and terra cotta. A fine flight of granite steps leads to the main entrance at the center of the building, which is placed about 50 feet back from the sidewalk to permit of landscape decoration.

The State Education Department occupies the first

floor. The State library is located on the second floor. Various educational divisions, including the examinations, and educational extension divisions, and the library school find place on the third floor.

The State museum is allotted ample space on the fourth floor. Here in rooms lighted from above, are adequately housed the scientific collections of the State. The New York State Museum is one of the oldest public scientific museums in America, and it has the largest scientific collection belonging to any State in the Union. These collections, previously scattered through five buildings, are in many respects unequaled. Previous to the opening of the new museum scientific specimens of all kinds were stored away in many hundreds of boxes and cases, some of which had not been opened in half a century.

The principal room of the new museum is 570 feet ong, 50 feet high and 54 feet wide. It is subdivided into sections, and is one of the most spacious museum rooms in the United States.

The library reading rooms are very large. There is an enormous stack room for 2,000,000 volumes. A novel feature of the library is the introduction of stack rooms in the center of the building, for easy access. The general reference room has stone walls and is lighted by eleven large leaded glass windows. Its dimensions are 106 by 130, the ceiling

being 50 feet high.

The basement contains
the big safety vault, 15 feet by 43 feet, for the keeping of valuable documents. Within this is a small vault of special construction which ed for the storage of the "Emancipation Procla-mation." Washington's Faremation, washington's Fare-well Address, the André pa-pers, the King Charles II Charter, the Washington relics, etc. Large fans for forcing fresh air to all the offices are provided in the basement. There is also a

The entire cost of the building was three and one half million dollars, the atte costing nearly half a million more. The space pro-vided is 11,348,850 cubic feet, as compared with 14, 475,000 cubic feet of apace within the State Cepted building, and this great area is expected fully to meet the requirements of the



New York State Education Building at Albany. and the state of t

#### Correspondence

fore are not responsible for statements correspondence column. Anonymous com-counts be considered, but the names of size will be withheld when so desired.)

を表現している。 1987年 - 19

#### The Domestic Dough Kneader

To the Editor of the SCIENTIFIC AMERICAN: To the Editor of the SCHENTRIC ALBRICAN:
Seeing in your number for July 13th, page 41, Notes
for Investors, "Wanted, a Donesetic Dough Kneader,"
you have it now. We all have it in domestic service, in
the form of a mest chopper (outting mest by revolving
blades). If a stiff blacuit dough is run through this three
or four times, it is well worked and makes the bread that
you might obtain by use of the old-dashioned fluted roller
or the more ancient method of beating the dough with a hatchet or hand ax for thirty minutes.

#### Railway Rails and High Speed

To the Editor of the SCHENTIFIC AMERICAN: In your issue of August 10th, under "Engineering," referring to the subject, "Reduce Railway Speed," in which the decision is "Too fast for safety," and the returning to the subject, "Medice Realway Speed," in which the decision is "Too fast for safety," and the remedy suggested is "More metal in the rail base," your reply is that "both points of view are correct," and farther on, that "the sole requirement is a heavier and better rail."

on that "the sole requirement is a heavier and better rail."
Kindy permit me to disagree with all of the above and
get down to the real and soknowledged cause of almost
every broken rail. It is the piston, main-rod, side-rod,
and counterbalance hammer-blow of the hundred-ton
locomotive. I contend that any rail that will best transportation and the necessary rough handling is competent
outerf place trains and heavier locomotives, by simply taking the han m-blow out of the locomoti

St. Louis, Mo. George J. Ferguson.

Gasifying Coal at the Mine To the Editor of the SCIENTIFIC AMERICAN:

To the Editor of the Scientific Alexancas: In the September 21st, 1912, number of the Scientific Arbeita (1912, number of the Scientific Arbeita (1914, number of the s of Bette for utilizing unmined coal consist el as it lies in the seam in a similar gastrying the rue as it less in the seam in a similar manner to that in which it is gasified in a gas-producer; shafts are sunk, boreholes made, a fire started, and air and steam supplied. Betts describes a number of methods of working in his claims.

New York city.

#### The Bureau of Chemistry

To the Editor of the SCIENTIFIC AMERICAN:

I inclose some notices of judgment in pure-food law ases, apropos of some correspondence noted in your

The fines are always so absurdly small that they have no deterrent effect whatever. The unreasonable delay in publishing these notices makes it impossible for the trade press to notice them. A case which was ended ten months ago is too ancient for notice. It certainly looks as though deliberate effort were being made to stifle the law in the courts and by the judges of the Federal bench.

This sounds absurd, but the notices I inclose are not nusual. They are just the ordinary run. San Francisco, Cal.

A. CROPTON

The notices referred to by our correspondent are the

Notice of fingment 1605, entitled "Adulteration and Mishranding of Lemon Flavor." "On February 18th, 1912," the notice ends almost apologetically, "the defendant entered a plea of guilty and was fined \$100 and costs, this being a second offense."

costs, un being a second orience." Notice of judgment 1609, entitled "Adulteration and Misbranding of So-called Castor Oil." The last sontoness of the notice reads: "On February 18th, 1912, the defendant or provention entered a pies of guilty, and the court traposed a fine of \$10 and costs." Fines of this nt for manufacturing firms amount only to a small

Hossis. Notice of judgment 1804, entitled "Adulteration of Oysiers in Steal." We fine was imposed. The notice does not even insulion the name of the shippers. The region was not issued until at months after final action. Notice of judgment 1897, entitled "Adulteration of County Cuty, select "Ostanto Pulp," select "Ostanto Pulp, select "Ostanto Pulp,

Markey Swikingsplade . . .

n and forfeiture was entered, and it was further ordered that the products covered by all libels should be destroyed by the United States Marshal and that the barrels containing the same should be sold." In the

barrels containing the same should be sold." In the opinion of our correspondent, "such judgments make a fareo of the law. They say in effect: 'If you get caught, you lose that particular shipment. That's all."

Notice of judgment 1600, entitled "Adulteration and Misbranding of Highland Brand Tomato Catsup; Missanding of Ompound Glucose Apple Jelly; Adulteration of Waldorf Brand Tomato Catsup." The notice comments upon the filthy and decomposed condition of the shipment. "On March 19th, 1912, the defendant commany ampeared in court and entered a piece of valor was a commany ampeared in court and entered a piece of valor was a commany ampeared in court and entered a piece of valor was a constant. one supment. "On March 1942, 1942, the defendant company appeared in court and entered a plea of node contenders, whereupon a fine of \$1 was imposed in each of the three cases, with costs." Our correspondent naturally asks: "What can will be served by a \$1 fine?" Notice of judgment 1603, entitled: "Adulteration and

Misbranding of Frutena." In this case the Acting S tary of Agriculture decided: "On February 13th, 1 "On February 13th, 1912, e of condemnation and forfeiture was entered, and it was further ordered, upon presentation of a bond in conformity with section 10 of the Act, and payment of

contently with section 10 or the Act, and payment of costs, that the shipment be released and delivered to claimants." The name of claimants is not shown.

Notice of judgment 1602, entitled: "Misbranding of Vanilles Salad Oll; Adulteration and Misbranding of Vanilles Flavor." The decision reads: "On January 5th, 1912, Flavor." The decision reads: "On January 5th, 1912. the defendants entered a pies of guilty, and they were sentenced to pay a fine of \$25 on each of three counts, namely, mishranding of salad oil, adulteration of vanilla flavor, and mishranding of salad oil, adulteration of vanilla flavor, and mishranding of vanilla flavor, and coststaxed at \$25.38." Thus, in the opinion of our correspondent, is another typical fine. "The length of time elapsing between the date of judgment and the issuance of the notice," he states, "is seldom less than seven months—sometimes a year. This kills publishly in the trade journals, which would record cases otherwise."

We rubblish the foregoing letter and the comments.

publish the foregoing letter and the comments We publish the foregoing letter and the comments thereto (emanating from the writer of the letter) merely that all sides of the administration of the Pure Food and Drugs Act may be considered. The SENNITY AURIELOAN is concerned chiefly with the silventific work required to administer the law effectively. It has no doubt but there are logal difficulties in the way, as well as senentific incompletence in the Bureau of Chemistry—Endrough.

#### The Mississippi River Problem

To the Editor of the SCIENTIFIC AMERICAN The platforms of both the principal political parties declare for such measures as may be found necessary to prevent disastrous floods in the Mississippi River. Any work in this direction by the general government

must be preceded by legislation; legislation should be preceded by intelligent understanding of the situation; when the facts are generally comprehended, the merits of any proposed measure can be weighed and the best adopted.

It is a fact that the plane of flood height of the lower It is a fact that the plane of food height of the lower Missishpit is certainly increasing; the proof is found in the increased heights of levees now necessary over those of a short decade For instance, the North Protection leves in Carrollton bend previous to 1890 was nine feet above the surrounding land; in 1893 the high water reached the top of the lower, sense then it has been raised to eighteen feet; the recent high water of this yearreached within five and one half feet of the top of thus levee, notwithstanding numerous breaks in the levees

The causes of the steady increase in flood heights are: the clearing of forests and increasing areas of land in cul-tivation; the reelamation and ditching of vast areas of ewamp lands; the cramping of the capacity of the river bed by the building of levees; the natural tendency of the river bed to slowly rise. These conditions may be expected to continue.

The underlying fact is, that more water is forced into the wer Mississippi, at times, than it is able to deliver to the

Strictly speaking, the Mississippi River flows into an estnary of the Gulf of Mexico which extends inland to the mouth of Red River.

When the silt-laden waters of the Massissippi flow into this estuary, there begins a precipitation of the silt. Before the construction of the jetties this silt was finally Before the construction of the present sun and arrange of the estuary and formed bars that were an obstruction to navigation, the removal of which led to the building of the jettles, which are but a which and to be designed to induce a current to carry the silt out into the Gulf. It will be apparent from this that the reach of the Mississippi, below the mouth of Red the reach of the Mississippi, below the mouth of Rad River, needs and must have an active current to main-tain the present depth of water through it and through the jettless. It follows then that any plan for the diver-sion of witesy from the Mississippi should not interfere with the normal flow needed below the Red River. By act of Congress approved June 28th, 1910, the Mississippi River Commission was directed to investigate

the "mecessity, urgency, and practicability of per-uty separating the waters of the Red and the

Atchafalaya rivers from those of the Mississippi River." This is the first step in the direction of diverting water om flowing into the Mississippi, and will undoubtedly afford some relief to the section below the mouth of Red River, which is the real danger spot of the problem; at the same time it is in the line of preventing the Mississippi rom making a new route to the Gulf ma the Atchafalaya

The writer believes that it is practicable to relieve the stire valley, from Cairo down, from destructive floods by utilizing a natural drainage channel that parallels the Mississippi on the west.

At a point on the Mississippi about fifty miles above Cairo and immediately below Cape Girardeau, Mo., the head-water tributaries of the St. Francis River are but ten to fifteen miles distant, with no physical or topo graphical obstacles to the construction of a drainage canal to draw from the Mississippi a portion of its flood

re is at hand an inexhaustible supply of stone to make the intake impregnable at a minimum cost

The flow from this canal would be into one of the tributaries of the St. Francis, where it would end; its control would then be assured by the building of low ees placed far enough apart to provide the area needed without exceeding five feet in height; in fact, through the "Sunken Lands" district of Missouri and swamps of Arkansas the levees might be placed as far as ten miles or more apart, thus impounding considerable bodies of water to drain off slowly.

From the St. Francis a canal of twenty-five miles would connect with the White River. This canal need be no wider than the St. Francis, nor deeper, at the intake, than to add a percentage of its flood waters, the control of all being secured by the line of low levees. From the White River a canal of ten miles would connect with the white raver a canal of ten miles would connect with the Arkanass River at a point where a canal of about fifteen miles would connect with the headwaters of Bayou Bartholomew. Where Bayou Bartholomew emptics into the Ouachita River the distance to connect with the Castor or Little River is about thirty miles, but by fol-lowing down the Cuachita seventy-five miles, the dis-tance is but ten miles. The Little River through its connections flows into Catahoula Lake, thence into Red

From Red River to the Gulf, choice could be made of rrom near river to the Guir, nonce could be made of various routes. Louisians, between Red River and the Guif, is a network of bayous and streams that lead to tide water. The construction of a special waterway to flow into either Grand Lake or Vermillion Bay would not be an expensive proposition.

The entire distance from the head of the first canal on the Mississippi to Red River is through low-lying lands subject to overflow from local streams, there being but a small percentage under cultivation

small percentage under cultivation.

The net result of the plan thus outlined would be the diversion of a portion, if not all, of the flood heights of the Mississippi above Cairo, the St. Francis, White and Canada and Ca Arkansas rive ers, without affecting their regime at ordi-The natural conditions permit the placing mary stages The natural conditions permit the placiful of levees far enough apart to provide for the volume water without building them to exceed five feet high.

An outlet from the Mississippi cannot be attempted anywhere below the mouth of the Ohio, through the light alluvial soil, without risk of inviting the entire river to change its channel.

The diversion suggested in this article begins at a point on the river above the mouth of the Ohio, where condutions of soil and proximity of stone make it safe to draw from the Mississippi all, or a portion, of its flood water; the streams flowing toward the Gulf supply the directing channel and slope of bottom; the short canals needed to connect and make continuous the system are inexpensive to build; it will cost less to build new levees five feet high than to raise the old ones two feet

There is another possibility in the line of diversion, here the Tennessee River touches the northeast corner where the Tennessee River touches the northeast corner of the State of Mississippi, it is but about twenty miles to the watershed that empties into the Gulf thr Tombigbee River, its connections, and Mobile Bay.

An inexpensive survey would determine the practicability of diverting the flood waters of the Tennessee Raver, which would help reduce the flood height at Cairo and the entire valley below.

It is a serious question whether or not the levees on

the lower Mississippi should be made higher. The high water of this year flowed over the tops of many of them two to three feet. From past experience it would seem that the limit of height has been now reached, with some twenty-three feet above the surrounding land.

An example of what dependence on high levess may lead to is found in the disaster on the Yellow River in Chian in 1852, when the floods broke the levees, made a new channel to the sea, with its mouth ax hundred miles from the old one.

The time is here, right now, when a choice must be estween some system of diversion or higher levees The Mississippi River problem must be solved correctly ad quickly or the lower valley will retrograde in popu-

SAMUEL L. YOURTER

# Aerodynamic Experiments of Duc de Guiche By the Paris Correspondent of the Scientific American The possession of accurate scientific data as to wind

This possession of accurate scientific data as to wind pressure upon plane surfaces is of insettinable value to designers of accopiances or airships. Such data are, however, very difficult to obtain, and up to the present but for experimenters have returned to undertake the work. On this account the researches which have been made in France by Ince de Guiche are of great interest, the more so as he employs surfaces mounted on an automobile so not to approach very nearly the conditions which occur in actual practice. Heretofore most experiments of the kind have been made in the absoratory.

What he desires to obtain is not the total pressure on a deven surface, but the pressure on a few surface, but the pressures at different points, as it is well known that such pressures are quite different at the edges and the middle of the plate. The present experiments were carried out in the forcests of Villefermory, most Paris, on a specially prepared stretch of road, over which the automobile carrying the apparatos was run.

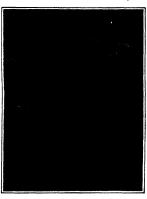
The road was treated with tar for a stretch of 200 feet so as to avoid detector-ation and to keep dust out of the apparatus. Stretched across the road 10 meters (22.8 feet) apart were two rubber tubes, so that the wheels of the automobile could run over each tube in turn and give a record by compressing the air in the tubes. These latter were closed at one end, while the other end communicated with the recording device in a small cabin at the side of the road. Both tubes were joined to a Marrey capatie or pressure indicator in which the air pressure sudicator in which the air pressure

needle on the disphragm makes a mark on a smoked paper carried on a rotating cylinder. With the cylinder rotating at a given speed by clockwork, the distance between the two marks on the cylinder produced by the passage of the wheels over the two tubes thus shows the speed of the automobile. A tuning fork is mounted so as to record its vibration continuously on the cylinder in the form of small waves, so that by counting the number of waves lying between the two notches produced by the disphragm needle we have the speed very closely, knowing the number of vibrations per second of the tuning fork and the distance between the rubber tubes. The rear wheels of the auto-mobile also make records in the same way as well as the front wheels, and these can be used as a check on In the experiments the automobile was started at 300 to 2,000 feet back of the tubes so as to reach a constant speed at the point where the record was made. The plane surface to be tested had to be was made. The plane surrace to be tested had to be accurately flat, otherwise there would be errors in the experiment. The surfaces were made true to within 0.002 inch. The plates were made of wood braced with metal or in other cases of aluminium. The wood plates had a length of spread of 4 feet 5 inches and a width and a rengin or spread of 7 feet 5 inches and a of 2 to 3 feet from front to rear, with a thickness of 0 6 inch. The aluminium plate was 2 feet 8 inches square and 6 32 inch thick in one case. Other sizes of plates were also used. In all cases they were mounted over the front part of the automobile upon light and strong supports of angle fron and the plates could be

adjusted at any angle by swinging on pivots, the angle being measured by a graduated sector at one side.

being measured by a graduater sector at one size. When the automobile is rauning on the road, it usight be feared that its movement would cause disturbances in the air which would be felt upon the plane surface and thus cause errors in the experiments. To this end the automobile was made as fat as possible and all precautious were taken to have it give but ittle disturbance. The test place was mounted at a height of 4 feet 4 inches above the plane surface which covered the hood, and this latter was 4 feet 6 inches from the ground. A light silk ribbon streamer was mounted in the space between the test plate and (concluded on page 27.6.)

Two photographs of the pressure gages,



Determining the speed of the car.

Launching of the Battlenhip "New York".

Price Shap of U. S. Neey to Measure the 14-hoch Gen
THERDE was launched on October Soft at the New
Tyork Nevy Yard, the "New York," a battleship
which marks a decided etap forwird in the development
of the fighting power of our Nevy. The ship takes over
the name formerly held by the first of our armored
craisers, the famous "New York," which served as the
flapship of Admiral Sampson during the Spanish War.
Those who were present at the recent review in
the Hudson River were much impressed with the
"Wyoming" and the "Arkanasa," the latest and largest
ships of our Navy present on that consisten. These
vessels are 663 feet in length over all, of 20,000 tons
normal displacement, and they carry a

normal displacement, and they curry a main battery of twelve 12-inch, Social-ber guna. The "New York" and her sister ship, the "Texas," which was built at Newport News, are 573 feet in length over all and of 27,000 tons displacement, and their bettery consists of the 35-caliber 14-inch guna, carried in five two-gun turrets.

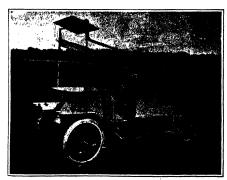
turests. The "New York" is the third battleship of our new navy to be constructed at the New York Yard in Brooklyn. The first of these was the "Connecticut." now flagship of the Atlantic Fleet; the second was the "Florida," now in active commission in that fleet, and the "New York," which left the building ways on the morning of October 30th, is the third and by far the largest of the three, the respective displacements being, "Connecticut," 10,000 tons: "Florida," 21,825 tons; and "New York," 27,000 tons.

The keel of the New York was laid September 11th, 1911, and in the period of practically 14 months which has elapsed since that date, over ten thousand tons of material

since that date, over ten thousand tons of material have been built into the ship, this being her launching weight. This fine ship has been constructed under the immediate supervision of Naval Countractor John E. Balley, to whose energetic supervision and the scal and heatry co-operation of the excellent working force of the yard, are to be attributed the early completion of this ship and the high character of the work which has gone into her. The ships built at the New York Navy Yard are proverbial for the thorough character of their construction, as witness the excellent record of the "Connecticut" and the "Florida." Although no one is prepared to deny that Navy Yard ships cost more than those built by private contractors. It is a question whether the high character of the work done and the reliability of the ships in service, to say nothing of the permanent retention at the yard of a highly skilled force of mechanics, do not fully compensate the nation for the extra outlay.

The recent ships built for the first line of defense of our Navy have the great advantage that in their main characteristics they greatly resemble each other. Each vessel is an enlargement and an improvement of the one that preceded it; there is no such bewildering diversity of design as characterizes—or until recently did characterize—some of the foreign navies. Thus the 'New York' is an enlarged 'Wyoning' the 'Wyoning' an enlarged 'Biorda,' the 'Biorda' a growth in natural and proper sequence from the 'North

(Concluded on page 275.)







Mounting of the gage box and camera.

### The Bushmen of Africa

Their Paintings and Etchings

By W. E. Gardner

(Photographs supplied by Dr. Elmore)

TO the greater portion of the availized world, Nouth Africe is a land of mystery; a welled book. But to those born in it, and to others who have gone to it to make it their home, it is a land of fascinating interest. It is at once one of the oldest and one of the most wonderful countries of the globe. Of comparatively recent years in has been known elucity for its wast quantities of gold and diamonds, but its main interest attaches not to those two great sources of wealth. Throughout its mighty length and breadth, Afrera convessis hostorical secrets the antiquity of which reaches back to times when the human race was in the very cardle of its evolution. To explores of the Dark Continent, one

To explores of the Dark Continent, one of the most interesting phenomena has been the commonities of what are known as Bushmen paintings. They are found throughout the sub-continent. In the various caves and natural shelters occupied in their wanderings by normadic Bushmen are to be seen to this day, in a wonderful state of preservation, their crude paintings on the faces of the rocks.

Investigation traces the Bushmen back to the Paleolithic Stone Age, and their direct descendants are to-day met with principally in the dense-forcet dwellers of Contral Africa, though also in solated instances in the Capic Colony. They have, through inon-intermarriage, preserved the purity of their race - but at the cost of remaining one of the most retrograde among the native tribes. They continue to dwell in the caves and rock fissures in the same primitive state as their ancestors of thousands of years ago; and oven their chief weapons still are the little bows and arrows (the latter made infallibly deadly with the venom of snakes) such as their progonitors of romote ages used.

of romote ages used.

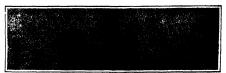
The Bushmen were undoubtedly the aborginal minabitants of this country. After Dr. Phillip started a mission at Loverherg, in 1814, these people, who had been living by plunder, soon learned to be self-supporting, and when it was abandoned (by command of the Governor at that time) they degenerated again into bar bushmen This fact proves that had the Bushmen been properly treated there would have been no repressals on their part, for during the three years of the mission no depredations at all were committed by them. When, however, their game was driven away and their fountains were confiscated by the Bores, there was nothing left for them but to steak the flocks and herds to enable them to exist.

As started, game constituted their main

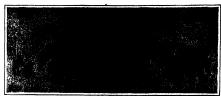
As stated, game constituted their main food supply, which are unstance accounts in all probability for practically the whole of their paintings depicting incidents of the chase. It should, however, be mentioned that some of the subjects are supposed to represent religious ideas. Indeed, there can be no doubt that a considerable number of the paintings illustrate Bushmen mythology, and this being so, they must be regarded as something vanity more expressive than mere dualte executed for expressive than mere dualte executed for expressive than mere dualte executed for the poorties of the state of the control of the theory conveyed a distinct and definite pur-

pose.

It will no doubt interest Americans to learn that one of their countrymen, Dr J. Elmore, of Kanasa Ctiv, Messouri, for some considerable time has been making a clear study of Bushmen paintings, and when his investigations are concluded he will not only rank prominent among the foremost authorities on the subject, but he will also be the possessor of one of the most complete and most accurate, if not the finest, collection extant of these univous



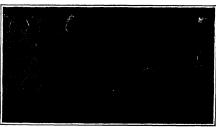
Bushman painting of the chase. From the original of Post Elizabeth.



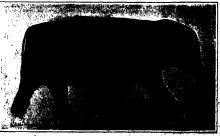
Hunters rounding up a herd of elephants.



A fine group done in several colors, found at Post Catherine.



A miscellaneous lot of human and animal specimens.



A Bushman's painting of an elephant

works of art. The next best collection will be that in the entody of the Port Klisabeth Museum, South Africa, Dr. Elmore having, at the cost of infinite labor and time, reproduced in true detail and color an entire set of this own tendings which he generally donasted to that institution. One of them is fourteen feet in length. Dr. Elmore's collection will, however, usual that of the museum insastnuch as he, being the possessor of over two hundred different and separate drawlings, can copy any number and effect ecohanges with other collection.

For twenty years Dr. Elmore's tours have taken him beyond the Victoria Falls; he has tarried among the Matopos—the resting place of Cevel Rhodes; Rhodesia, Matabelsaland, Matabelsaland, Matonasaland, and in the West, Zululand and the Garden colony of Natal; while there is hardly a square mile of the Cape, Orange Pres State and the Orange Company of the Cape, Orange Pres State and the Inquires into natural history away been extremely varied. He has succeeded in getting two thousand specimens of butterfies, which he presented to an American museum. The ophidia have also claimed his interest, and he prepared gratuitously for the Durban Museum the skeleton of a Natal rock python, the task cocupying him cighteen months. During the last two years he has given his study to Bushmen paintings and Kaffir folk-Ore in all parts of the country, as well as to native manners and customs. In these last investigations he has enjoyed exceptional facilities by reason of the fact that he has had access to all the literature concerning the aboriginal and native tribes since 1870.

In Bushmere paintings it has been stated that the subjects chosen by the primitive artists were mainly game; and the now fast-dring cland, one of the largest and most besuitful of the African antelopes, was the animal specially favored by them. By the courtery of Dr. Elmore I am enabled to supply the Scientific American with photographs of the paintings for reproduction, but they lose considerably by having to be printed in the ordinary black and white instead of in the quaint tinte found in the originals. The colors in which the paintings have so far been discovered are red, yellow, blue, brown, black and white instead of in the quaint tinte found in the originals. The colors in which the paintings have so far been discovered are red, yellow, blue, brown, black and white, and Dr. Elmore is convinced that they are the natural oxides. At Poet Catherine, beneath some paintings, he found a natural pocket of color. It was the pigment of the rock; a beautiful yellow than which a superior cannot even now be made. On taking a little on the finger-nail and comparing it with a picture, the dooter found the tint to be exacely similar. At another place some other oxide that had weathered off the rock was seen and proved on examination to be as fine a powder as the most perfect grinding machinery of the greecest time sould produce.

on examination to be as fine a powder as the most perfect grinding machinery of the greesent time could produce.

In the course of his investigations the doctor concluded that when the Bushmen winded to represent two animals standing so closely together as to "overlap," they adopted the slow method of first depleting one animal and leaving it to dry and then painting the other upon it. The reason for this undoubtedly was that the plamies possessed no exists of perspective. On one or two coastons Dr, Elmore came across shaded drawings.

two consons III. Enhance came across shaded drawings.

Where the double pictures are seen it would indicate that the little savages were sufficiently long in occupation of the particular caves to have been able to devote other appreciable time to their work; while in the limit is the particular in the limit in the little in the limit is the particular appreciation of the limit in the little limit is the particular appreciation of the little limit is the little limit in the little limit in the little limit is the little limit in the little limit in the little limit in the little limit in the little little limit in the little limit in the little l

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#### The Heavens in November

#### The Defining Power of Small Telescopes

By Henry Norris Russell, Ph.D.

ALS'S comet, of whose discovery we spoke last A mouth, is still visible in the evening sky, but only with the telescope. At the beginning of November it is in 16 hours 3 minutes right ascession and 25 degrees north declination, and is moving a little less than 1 degree northerly and 1 minute easterly per diem. Its old is nearly, if not quite, parabolic in form, and is narkable chiefly for the fact that its plane is almost remarkative curses for the entry that its plane is aimost at right angles to that of the ecliptic. Its closest ap-proach to the Sun occurred on October 5th, at a dis-tance of 67,000,000 miles. Though now growing fainter, it will probably be telescopically visible for some time

100 march 100 ma

The second comet to be discovered in 1912 was de-tected by Schaumasse at Nice on October 18th. It was then in the constellation Sextans in 9 hours 58 minutes B. A. and 1 degree 36 minutes north declina-tion—about 10 degrees south of the bright star Regulus in Leo-and was moving eastward. Until further observations have been obtained, and its orbit com puted, it is impossible to say whether it will become conspicuous, or remain faint, as at pres-

ent; but the chances are in favor of the

A recent inquiry from a correspondent ests the discussion of the question of the defining power of small telescopes such as are in the bands of many ama-teurs—especially of those from two to five inches in aperture.

ven the smallest of such instrumen will reveal enough to afford the star-gazer many evenings of the keenest in-terest; but there are, of course, limits to the power of any given telescope, both theoretical and practical, and of some of nese we may well speak.

The principal functions of a telescope

are its light-gathering and magnifying powers. The former depends primarily on the clear diameter—or "aperture"—of the object-glass; the latter, on the rela-tion between the focal lengths of the ob-

ject-glass and eye-piece.

The pupil of the human eye, when widely expanded, as it becomes in a faint light, is about one fifth of an inch in diameter. A telescope two inches in aperture collects all the light falling on a circle of ten times the radius, or one hundred times the area; and hence, if all the light fulling on the object-glass was concentrated, without loss, into the observer's eye, such an instrument should show stars one hundred times as faint as the faintest visible to the eye without its aid. In actual practice, the losses of light

aid. In actual practice, the losses of light by redection at the surfaces of the lesses, and by absorption in passing through them, diminish the light-gathering power to about two thirds of this lideal value, so that a two-inch telescope will actually above sizes about 55 times finiter than those just visible to the naked eye. For a four-inch glasse the limit of brightness would be four times fainter; for a six-luch, nine times; and so on, in pro-portion to the square of the linear aperture.

These facts may be stated in another way, by giving

a little table of the stellar magnitude—in the ore astronomical reckoning-of the faintest stars visible to a normal eye with a good tele ture, under favorable conditions.

Aperture 1 in. 1 1/4 in. 2 in. 2 1/2 in. 3 in. 4 in. 5 in. Magnitude 9.0 - 9.9 10.5 11.0 11.4 12.0 12.5 It should, however, be clearly understood that this table shows only what a telescope may be expected to do on a fine clear night, with dark sky (not in moonlight) and with steady air; and that it applies to iso-lated stars, and by no means to the faint companions of bright ones or the faint satellites of the bright

For example, the third estellite of Juniter, if isolated, fairly bright stars, at the same annarent distance in fairly bright stars, at the same apparent distance in the beaven as Jupter and this satisitie (when bist placed) could be easily separated without instruments and. But Jupter is so higher that its satisfies are existally hopelessly beyond the reach of unabled vision. "With respect to seguritying power, the observer has a little more freedulin, for by a simple change of ey-plants to suppose the easy power to another. But

Bereit Committee of the Committee of the

here again there are limits. With a power less than again there are mank. With a power less than for each inch of aperture (e.g., less than 15 for a p-inch telescope) the light which enters the object-ies not all concentrated into the observer's eye, glass is not all concentrated into the observer' and the power of seeing faint stars is decreased. a power exceeding about 60 for each inch of aperture e hazy, and no advantage is gain by further magnification.

The reason for this is found, not in any imperfections of the instrument, but in the nature of light itself. It can be shown (by methods far from elementary, but mathematically trustworthy) that, if an image of a star is formed by a lens of a given diameter, this image will not be a perfectly sharp dot, but a small disk of light, fading out gradually toward the edge, and surrounded by rings of light, only a few of which are usually bright enough to be seen. In the same fashion, the image of a narrow line of light has the form of a linear band, of small but definite width, with faint attendant bands on each side. These "spurious disks," rings, or bands of light are merely optical phenomena.

seconds by the aperture in inches, the results being Aperture 1 in. 1½ in 2 in. 2½ in. 3 in 4 in. 5 in. Limit of Separation. 4.5 in. 30 in. 2 3 in 18 in 15 in 11 in 09 in

It must once again be emphasized that this applies to the most favorable conditions the pair must be of sufficient and nearly equal brightness; the air must be clear and steady, and the observ-er's eye must be trained; for in such a case the two stars seem so close together that the novice might easily take them for one

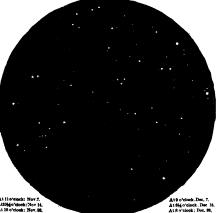
When (as unfortunately is almost always the case) the air is unsteady, the star-images dance about and change shape, and it is only in more or less fleeting moments that they are well enough seen to reveal the two tiny disks of light.

A pair of stars of very unequal brightness must be much farther apart to be observable. As an extreme instance we may take Sirius. This has a companion instance we may take Strins. This has a companion of magnitude 8.5—which, if isolated, would be consplenin a two-inch instrument. When nearest to Strins (about 1893) it was (according to the computed orbit) fully 2 seconds from it.

A pair of stars of equal brightness, at the same distance, could easily have been separated with a three-inch aperture But, owing to the glare of Sirius, which is ten thousand times as bright as the commanion, the latter could not be seen. even with the great Lick refractor, when

nearer than 3½ seconds to its primary.

It should finally be remembered that
the objects mentioned in treatises on astronomy as "good tests" for a telescope of a given aperture are purposely so that only an instrument of first-class workmanship (and of the given dimensions) will reveal them to a practised eye. under the best observing conditions. Hence the amateur need blame neither his telescope nor himself if he fails to observe them satisfactorily until after acquiring experience on easier objects, and then after many trials.



At 916 o'clock: November 30. NIGHT SKY: NOVEMBER AND DECEMBER

and have no counterpart in the nature of the object servation, but they cannot possibly be avoided. When the aperture through which the light passes is narrowed, this "diffraction pattern" grows larger, is narrowed, this "diffraction pattern" grows larger, doubling in size if the aperture is halved. When the ening is very narrow, they may even be seen by the ked eye. For example, if one looks at a linear source of light (such as a flat gas flame seen edgewise) through a narrow gap between two lead-pencils held just in front of the eye parallel to the line of the flame, it is easy to observe that, when the slit through which one is looking is made very narrow, the line of light seems to widen out, and to be accompanied by or ugut seems to widen out, and to be accompanied by fainter hands on sach side. A still more instructive ex-periment may be made by looking, through the same improvised slit, at a pair of fine parallel lines close together—such as two wires or strings against the sky. As the cilt (which again must be kept parallel to the strings) is narrowed, the dark lines become

ill-defined; and they can no longer be seen double.

This lutter experiment illustrates perfectly why it is impossible to separate the components of a very close double star with a small telescope. What the eye sees counte mar with a small telescope. What the eye esses directly in this cue case is just what it would observe, with the still of sutable magnifying power, in looking at a double size it rough a telescope whose clear appreture could be dissipatished by an inte displayage. When the opening dissipations to a certain size, the star can no longer-be send double.

This theoretical limit of separation of the observe that of star can receive the star can not longer to send double.

pair of stars that can be resolved by a telescope of given aperture can be found by dividing 4 minutes 5

#### The Heavens

stellations have now returned to the evening sky. Orion is in the southeast, with Sirius blazing below, and Aldebaran and the Pielades above. Auriga is high in the northeast, the Twins-Castor and Pollux—are below, and Procyon still lower down, due cast.

In the duller region of the southern sky

we find the extensive constellations Eri-dams and Cetus, which are perhaps most noteworthy as containing two of the very nearest stars visible to the naked eye. These are  $\tau$  Ceti and  $\epsilon$  Eridani, both of

which are shown on our map. That the former was a near neighbor of ours has been known for some years, but recent measures show that the latter has also a parallax exceeding 3 seconds and a distance of about ten light years & Eridani is also near us, though almost twice as far away

Perseus, Andromeda, and Aries are almost directly overhead. Pegasus, Aquarius, and the Southern Fish are in the west and southwest, and Cygnus and Lyra in the northwest

Ursa Major is low on the northern horizon, Draco and Ursa Minor but little higher, and Cepheus and Cassiopeia well up in the north.

The Planets.

Mercury is evening star all through November The set chance of seeing him comes about the 7th, when he is farthest from the Sun in appearance (though almost at the nearest point of his orbit to that luminary). He is, however, very far south, in Scorpio, and sets about 5:45 P. M., so that he will be hard to see.

Venus too is evening star, about 15 degrees west of Mercury, and sets about an hour later, but, unlike Mercury, she becomes increasingly conspicuous all through the month. On the 7th she is in conjunction with Jupiter, being 1 degree 43 minutes south of him. The two brilliant planets will be a fine spectacle in the

Mars is in conjunction with the Sun on the 4th, and is invisible.

Justier is evening star, as aircady described.

Saturn is in Taurus, between Aldebaran and the

(Concluded on page \$76.)

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Modern Methods of Handling Heavy and Bulky Merchandise

IN these days of "welestifle manage-ment," when the cost of everything has to be carefully considered, it is destrable to use every cubic foot of space in a warehouse and to do the work of stateding and removing cases, etc., with as few men as possible. When linnd was clessiper, not much thought was given to the area warled in warehouses; goods offen lay avound on the floors and the space near the evilings was neglected. If conditions required the goods to be fiered, many men wors required to do the work by the manufacturing the mental and treaght method. Nowndays, however, any lettice which will reduce the cost of handling materials is as welcome as may improved manufacturing device. Nuch a modern labor-saving device is jortable tiering matchine, an improved type of which is allowed by the committee of which is shown by the accompanying illustrations and is known as a

The revolvator is a portable thering machine which can be wheeled to any place in a storeroom or warehouse and used for stacking barrels, boxes, bales, etc. It consists of two unprishms 2nd an elevating platform. The box or hale is placed 62 reflex platform of the revolvator when down, as shown in Fig. 1, and by means of a crash and goars the platform is then raised to any level deadred. The device is then swung around on its own center, like a turntable, the wheels remaining fixed on the floor, and the load shoved off into place as shown in Fig. 2. Frequently the revolvator is swung around through 180 degrees, and the cases removed from the rear. This scheme makes it possible to stack a warehouse entirely solid and to eliminate all alsels.

Hollers are provided on the platform, so that as soon as the box reaches the desired level one man can easily slide it from the revolvator directly into the space where it is to rest. The revolvator is provided with double gears, one for high speed and one for low. Bales, cases, etc., up to 800 pounds can be easily handled by the high gear, and bales weighing from 800 to 1,500 pounds or more by the low gear.

In lowering boxes, bates, etc., the opera-

In lowering boxes, bales, etc., the operations are reversed, that is, the platform is raised to a point slightly below the level of the box to be removed. The box is then sild onto the platform and allowed to descend slowly until it reaches the foor. The descending load is at all times under the control of the operator, as the machine is provided with a band brake

There is no danger of the machine accidentially slewing pround with in operation, as the unright is provided with a ratchet which locks it to the base in different positions. Neither is there any danger of the machine moving on its wheels, for when wheeled to position, the front wheel is turned at right angles to the two rear ones, and as soon as the handle is dropped it locks the front wheels, making it impossible for the re-volvator to the

In order that the apparatus may be moved from room to toom through low doors or piaced on elevators and carried from floor to floor, the uprights are jointed, allowing the top half to fold over

The revolvator is used for handling cases, bales, barrels, rolls and reams of paper, crated machiners, bath tubs, etc. in warehouses, and is also employed for loading railroad cars, trucks, etc.

# Dumping Fifty-four Tons of Coal in Two Minutes

THE economical handling of coal on its way from the mines to the consumer is a problem affecting the retail



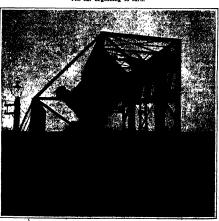
Fig. 1.—The box placed on the revolvator when the platform is down, is raised by a crank and gears.



Fig. 2.—The box when elevated to the desired level is easily rolled off into its proper place.



The car beginning to turn



The car in dumping position.

price of coal. The more efficiently coal can be handled in the various tra ments, the better. Water trans tation is the cheapest, and ea ing machinery has been devised at various American coal ports for rapidly and cheaply transporting the coal coming from the mines (in 80 and 100 car trains) into the holds of waiting vessels. The annexed illustrations show a car dumper in use at Norfolk, Va., in action. This car dumper is an integral part of an elaborate coal unloading plant constituting the tidewater terminal of one of he coal-carrying railroads from the West Virginia mines. Its operation is the most interesting feature of this plant, as it empties railroad coal cars holding 50 to 54 tons of coal each as easily as the driver of a coal cart tipe his load on to the sidewalk. The car dumper consists of a steel structure supporting a movable, elevated cradie. The loaded railroad cars are pulled up an incline one at a time by an electric motor-driven cable hoist. The moment the car reaches the cradle the car dumper operator starts a motor which first clamps the car securely down on to the cradle and then tips the cradle up and over through an angle of 100 degrees. so as to pour out the contents of the car onto a deflecting apron and into a receiving car waiting on a track level below The receiving car (which is electrically operated) then conveys the load of coal up on to the pier from which it is discharged into the vessels.

The illustrations show the car dumper in two stages of its movement, and the hazy appearance above the apron in the second view is caused by the cloud of dust that arose from the 64-ton mass of coal poured out of the railroad car an instant before the photograph was taken.

#### Miniature Baseball Game

A NEW amusement device has just been brought out which is played on a miniature diamond on a table similar to an ordinary billiard table. Miniature figures of players are used and they are disposed in the positions ordinarily occupied by baseball players on a regular diamond. The players are placed over a series of pookets. The face and ides of these pookets are cushioned and are so designed that the ball entereq quickly and quietly. On either side of the table and in the rear there are pookets indicating singles, triples, home runs and fouls. The batter's box is near the front of the table, where an average size billiard ball is placed and then caromed off on a triangular rubber homeplate which is mounted on a pivot. This plate rovolves when hit by the ball, giving the player a constantly changing shot which makes the

#### A Submarine Lifesaver

THE shock and horvor of the loss of the Tweethead of Toulon, who has just patented the apparatus, is an old sailor. His invention, as described in the marine journal, Naviguestic, consists of a waistcoat and a helmat. The former, which permits entire freedom of movement to the wearer, is double and can be inflated with air or gas under pressure. It should be dounced in every descent, and is intended to insure the rising of the wearer to the surface of the water.

to insure the rising of the wearse to the surface of the water.

The helmet is assumed only in case of danger and is meant to make respiration possible. It is capable of very rapid adjustment to the waistoost.

pustion. It is expanse or very supra surjustment to the waistooat.

The inventor is about to make three tests. The first, which will take place in a pool, is to show how long a man thus fur-

The same of the second

oil can live in the water. The second, the place in a part, will be conducted as ty as possible under the same condia real su s as in bmarine which has met ent. It is expected to prove with accident. It is expected to prove that the wearer of the apparatus will come to the surface with certainty. The third will also take place in a port, making of a salvage chamber, construct ianche to complete his invention. natruoted by

101

#### Compulsory Licenses By T. Hart Anderso

UNDER the provisions of the Oldpatent laws so as to provide for the grant-ing of compulsory licenses in those cases where a patent is more than four years old, and the patentee or those claiming under him fall to manufacture in the United States to an adequate extent, and provided the court is satisfied that the reasonable requirements of the public have not been satisfied by reason of the neglect or the refusal of the patentee to make, use or vend the invention, or to grant licenses to others on reasonable terms, it shall order the owner of the patent to grant a license to one applying therefor on terms to be

This brings up the question as to whether courts of equity have not heretofore had courts or equity have not heretorore had and do not now have the right to compel the granting of such licenses, and whother they have not in fact assumed such right never the character of the evidence has warranted it.

Injunctive relief alone prevents the continued infringement of a patent, that is to e manufacture, use or sale of the patented invention by a stranger to the patent and without the consent of the owner of the patent. We all know that the refusal of a license does not prevent the on of a patented in vention by one who desires to use it. One who so appropriates a patented invention, how-ever, places himself in the position of an infringer and is liable to the patentee for

If the owner of a patent sues for dam ares alone, and a verdict is rendered in his favor, the infringer pays the amount awarded, and if he still desires to use the awarded, and if he still desires to use the invention he may go on as before, leaving the patentee to his right of again suing him at any time within the running of the statuto of limitations. The damages recovered constitute in effect a license fee which the infringer pays, and we may which the infringer pays, and we may assume he is willing to pay for the license which he has appropriated. This is prac-tically a compulsory license while it lasta, and sometimes, owing to the crowded condition of our courts, it may last for and

a period of years.

The owner of a patent, however, as a rule not only desires to secure damages, but also an injunction preventing and re-straining the infringing acts in the future, and therefore patent suits are generally brought on the equity side of the court, and if the court finds the patent to be good and valid and that the defendant has ined it will issue an injunction restrain ing in the future the infringing acts of which the owner of the patent complains. As before stated, it is this injunctive relief which, when granted by a court of equity. puts a stop to the compulsory license aris-ing from the unauthorized appropriation by an infringer of a patented invention.

right to grant injunctions in patent suits is conferred upon the Federal Courts by statute, section 4,921 R. S. providing that such injunctions may be issued "ac-cording to the course and principles of equity, to prevent the violation of any right secured by patent, on such terms as the court may deem reasonable." The first legislation referring to injunc-

the first legislation retering to indus-tive relief in patent cases is the Act of 1819, which provided that the circuit courts of the United States "shall have authority to the United States "soan have authority to great injunctions, according to the course and principles of courts of equity, to pre-vent the violation of the rights of any au-thors or inventors secured to them by any of the United States, on such terms conditions as said courts may deem fit

and reasonable." This provision of the Act of 1819 was substantially embodied in the Act of 1836, wherein section 17 provided for the granting of injunct terms and conditions as said courts may deem reasonable." The Act of 1870, section 55, contains practically the same provision "and the court shall have power spon bill in equity filed by any party aggrieved, to grant injunctions according to the course and principles of courts in equity, to prevent the violation of any right secured by a patent, on such terms as the court may deem reasonable." Then as the court may deem reasonable." Then came the Revised Statutes, section 4,921 hereinbefore referred to, which is now the law, and which was amended by the Act of 1897 to fix a period beyond which ages could not be recovered.

It is therefore to be seen that courts of equity may fix reaconable terms upon which they will grant an injunction. It follows they will grant an injunction. It follows therefore that they may also refuse an injunction on reasonable terms. When-ever an injunction is refused, therefore, in those cases where the patent is good and valid, and infringement is proven pulsory license results, and in effect the license in such form and upon such terms as it deems just. Strictly speaking, the court does not issue a license, but in refus o disturb the infringer and to restrain his infringing acts, it to all intents and pur s grants a compulsory license.

Acting under the power thus conferred ourts of equity have time and again red injunctions where the patent was valid and infringed.

valid and infringed.

In the case of Bullard v. the City of Pittsburgh, 12 F. R., p. 783, it was found that the city had infringed the patents sued upon, in that it had laid a wooden pavement constructed in accordance with the patents, but the court declined to issue an injunction on the ground that "any inter ference with the use of the wooden pave-ments constructed in the city of Pittsburgh. in infringement of the complainants' rights. would only operate injuriously upon the public without benefiting the complainants, and injunction will not be granted. The court however decreed an accounting to ascertain the profits and damages which should be awarded the complainants, which was in effect the amount of the license fe to be paid for this compulsory license so awarded by the court. The court in this case undoubtedly found that the "reasonable requirements of the public" justified it in refusing an injunction on re

It is true that the courts heaitate to efuse injunctions where the right to relief under some conditions they will do so.
In the case of Campbell Printing Press

and Manufacturing Company v. Manhat-tan Railway Company, 49 F. R., 931, the rt while refusing to act on the defendsource while returning to set on the detection and's suggestion that because it was willing to pay for the use of the infringing devices it should be permitted to continue to use them on the ground that it would seriously the running of its cars if it were compelled to take off the infringing devices, yet the injunction was granted on terms which no doubt the court deemed sonable, and the defendant was given a ertain length of time to remove the alleged compulsory lie

grant preliminary injunctions would be greater than the advantages to the complainant, as in Hoe v. Advertiser the complainant, as in Hoe v. Advertiser Company, 14 F. R., 914, and thus on terms which seemed reasonable to the court, it in effect granted a compulsory license, at least for the time the suit was -ending

Suppose a case where the public health, public safety or the welfare of the nation were involved, what would a court of equity do should a patent owner seek an injunction restraining the manufacture, sale and use of devices which the evidence showed

save life, to repel invasion, and that there tutes immediately availab would it grant an injunction, or would it refuse the injunction because of the "rea-sonable requirements of the public" and cree compensation in damages and proits, thus in effect granting a compul We believe that in such a case court of equity would not besitate to refus an injunction, on the ground that an in-junction would operate injuriously upon the public without benefiting the com-plainant. It would however decree as accounting so as to ascertain the amount of damages and profits which would be payable to the owner of the patent for this compulsory license. Such a proceeding would not differ materially from that provided by Section 17 of the Oldfield bill to compel the granting of a compulsory license. It would therefore seem that in many cases where the "reasonable require-ments of the public" seem to require it, compulsory licenses are awarded by the

#### Legal Notes

Patentability of Article as Affected by Process of Making.—In affirming the de-cision of the Commissioner of Patents, In is Hodkinson application for patent for an iron or steel conduit pipe, the Court of Appeals of the District of Columbia has held that in considering the question of the patentability of an article made by whatpacentaouty or an article made by what-ever process one may choose to employ, the superiority of the process by which it is actually made is immaterial.

Some Adjudicated Patents. of the Carlson Motor and Truck Company v. Maxwell-Briscoe Motor Company, 197 Fed. Rep., 309, claim 1 of the Carlson pat ent. No. 797.555, for internal combustion engines was held valid and infringed. recently decided cases, the Coffield re issue patent, No. 12,719 (original number 806.779) was held valid and infringed; th Mell patent, No. 898,907, for vehicle whee tire, was held void for lack of invention in view of the prior art; the Washburne pat-ent, No. 517,084, for a cuff fastener, was held void for anticipation, also not in-fringed if conceded validity; the Wash-burne patent, No. 553,972, for a clasp or fastener, was held not infringed; the Moody patent, No. 591,869, for an electric trans ormer, was held not infringed, and th Coldwell and Gildard reissue patent, No 11,923 (original number 637,234), for a stop motion for looms, was held infringed.

Substitution of Material.—The question of patentability involved in the substitution of material raises interesting questions.

The case of ex parts Hobbs decided by
Commissioner Moore, in which he affirms. the decision of the Board of Examiners in Chief, involved the substitution of sheet metal for wood in billiard counters and the Commissioner held that it did require invention, the advantages alleged for the metal counters being due to the wellknown properties of sheet metal. In discuss se, the Commissioner said it was ing the ca believed to fall in the class of devices held to be unpatentable by the substitution of material, citing certain cases, because the infringing devices. During the running of properties, rather than in the class where that time, the defendant had in effect a ompulsory license.

Many times have the courts refused to He referred to on the being well set forth in Union Hardware ant preliminary injunctions on the being well as the first in which the Court ound that the injury to the defendant Company v. Selchow, in which the Court ould be greater than the adventages to said quoting another case: "Both involve a change of material in existing structures but in the one instance the skate operates after the change precisely as it did before, and in the other a hose supporter which does not support is converted by the change into a hose supporter which does support In the former case by the use of cheaper lighter and stronger metal the skate is madlved, what would a court of equity cheaper, lighter and stronger, in the other la patent owner seek an injune- siming the meantifacture, sale and metal button transformed a destructive vices which the evidence showed and inoperative device into a highly suemitial to prevent epidemios, to constitute of the control of the

#### Notes for Inventors

Adds Rubber to Resene in Chewing um.—In a patent, No. 1,040,285, James D. Darling, of Philadelphia, describes a manufacturing chewing gum in which he adds to resene a suitable proportion of rubber to render it plastic at the temperature of the mouth.

Clothes Washing Pounder.—In patent No. 1,039,701 to Edwin R Crooker, of Los Angeles, Cal., there is shown a clothes with a contral body having a handle pounde socket at its apex with a soap receptacle within the conical body at the apex and immediately below the socket for the handla

High-grade Flour from Low-grade Grain. For producing a high grade of flour from a grain low in proteids Johann Georg Fer-dinand Dombach, of Amsterdam, Netherlands, has patented, No. 1,040,290, a process for treating the grain which cons mixing with a quantity of the grain low in roteids about one half as much more light grain incipiently germinated, but whose germination is stonged before reaching the stage to produce malt

A Demand for Coal-weighing and Discharging Machine.—One of the Consular and Trade Reports of the Department of Commerce and Labor calls attention to the et that an American consul has inquiries from a firm in his district for automatic apparatus for discharging coal from sels, indicating that the apparatus should be capable of weighing the coal as it is re-moved and suggesting that a suction type of equipment which will remove the coal from below decks into the square of the hatch lifted up on deck, weigh it and deliver it into lighters, is desired.

A Piano Violin Patent.-Walter E. Fox of Chiango has seemed natent No. 1 036 -600 for a musical instrument in the of a mano violin having a keyboard and means for simulating the playing of violin which include in connection with framing, a vibratory string and an endless band traveling across the string and between pairs of rollers and twisted thereby to present a broad surface to the string and also means actuated from the keyboard for rocking the shaft carrying the rollers in order to move the band into engagement with the string.

A Syrup with Maple Sugar Flavoring. At this time when, so much is being said about the high cost of living, it may be interesting to note that a West Virginia man has patented what he terms a saccharine article of commerce which is composed of sugar and an extract obtained from the outside lifeless bark of the rock or sugar maple so that the syrup will have a maple flavor. In the process of making this article, the outside lifeless bark taken from the trunk of the rock or sugar maple tree is boiled in water until an extract of the desired strength is obtained and the liquid is then strained and commercial sugar added and boiled until the strength is satisfactory.

An Unsinkable Rubber Boat.-At the recent Rubber Exposition in New York, Mr Joseph Pastorel of Asbury Park, N. J., exhibited an ingenious rubber boat. The frame is governd with sheet rubber or rubber cloth in such a way as to form independent air-tight compartments which can be inflated to increase the buoyancy of the boat. The elasticity of the materials employed, in the opinion of the inventor, will enable the structure to withstand severe blows and shocks. When subjected to rough usage, the boat, he states, will yield instead of breaking, as it undoubtedly would if wood or iron were employed in its construction. Masts, inflatable square sails, and wings are included in the equip-ment of the boat. The sails and wings are made of rubber and can be inflated by compartments, the idea being that they will add to the buoyancy of the boat. When lowered all the way down, the sails rest on the deck and the wings right at the edge of the boat. The masts are made of

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The potices are inserted by special arrangement with the inventors. Terms on application to the divertising. Department of the SCIENTIFIC

#### Pertuining to Apparel.

HAT BUX — ULLIFE, 228 Adulbon Ave, New York, N Y This look is constructed of tokeropic services. The look is constructed of tokeropic services and the look of tokeropic services and the look of the look loo

#### Pertaining to Aviation.

Fertaining to Aviation, (TROPIAND-N E Blown, Grand Haven, Mich This invention contemplates a revoluble accopiane adapted to ascend or descend vertically, either in a bortsontal or inclined path The inventions is preferably termed a "gyroplane," this name being appropriated by reason of the analogy which the machine bears in action to the gyroscope

#### Electrical Beylees.

Electrical Devices,
HIGH POTENTIAL INSULATOR—Louis
RYEANAGER, Brookly, N. Y. Mr Nelenberg
er's invention relates to high potential insulators, and more particularly to such insulators of special form as are adapted to be
mounted upon a wall, a floor, a roof or a
partition or adapted for use in cuntertion with
oil switches and oil transformers, and in various annifogour relations

ous analogous relations TROLLEY WHE SWITCH OR FROM - J Knay, P. O. Ions 415 Deuglas, Arts. An object here is to make an easy and more relative connection between the main lines wire and a switch wire than has hitherto been possible. Also in provide means for reducing the about of a mispiaced trolby from becoming louded in a switch or frog

lodged in a switch or frog
CONNETTING TERMINAL—A. J. ALLEN,
Room 1821 Tribune Bidg. New York, N. Y.
This involution provides a contract member to
be secured upon the most of a facility conductto the secured upon the most of a facility conductportion serving the double purpose of a wing
server for holding said member upon said cord
and fitting upon a binding post for the purpose of establishing electrical communication
from said cord to the same.

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#### Stousehold Estitutes.

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NIADB INDEX - H Georgians, care of Chenge the DB P H Georgians, and C Cluton deep the DB P H Georgian of the Cluton Association (the DB P H). The Investment relates to an improvement in sinde holders for incandecent and other lamps and it embodies a construction that is designed to enable the shade to be readily and easily attached in post time with reference to the Junp globe or bulb, and as readily removed therefrom in case of danger or when, for any other reason, removal



SHADE HOLDER FOR INCANDESCENT AND OTHER LAMPS.

is necessary. Its use is not restricted to a shade holder, but may be employed in other resistance. The holder may be attached to the lighting fature on which it is used either in upright position or in horizontal or inverted position. The engraving pictures a side elevation of the holder holder position of the construction of the holder.

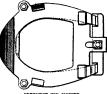
#### Of General Interest.

ANUNCYABLE SPRING BEADER.—F. A. RAME. SPG 2-derson Ave. Brooklyn, N Y. This statchment supports a camprised spring-bearing roll for use in prising prime bearing roll for use in prising prime, and prime prime, and prime within the limits has part of the part within the limits has part on the roll of the statchment. Provided the part of the contract within the limits prime paper on the roll of the statchment. Provided the for adjusting the derive as to him

HANANA PACK SADDLE.—A. B. Bonstra, P. O. Box S56, New Orleans, La. This meddle is designed for use in carrying bunches of banana from plantetion to receiving or leading stations. The audite comprises a top pacely, side pockets below the latter at opposite side of it and intermediate pads forming partitions between side and top pockets return to the partition of the partition of

Jury from the sun.

OVERISHOE FOR HORSES.—C. G. Denawo,
R F D., Taunton. Mass. The object of this
overshoe is to prevent the slipping incident
to cortain conditions of slime covered readways and to sleet and ic-covered prevenents,
the said calks are merpened, and preferably
formed from suitable hard wearing material



OVERSHOE FOR HORSES

such as chilled or air-cooled steel. In the usual practice to which the employment of the shoc lends itself, the overshoe is carried for use in any energency. The caraving presents a bottom plan view of the overshoe, showing the same in conjunction with the ordinary warting aboe to which the overshoe is secured.

Prime Movers and Their Acces Prime Movers and Their Accessories.
EXHARS MOTOR—C. F Bint, 1438 Will.
Itanson St, Madison Wis. The principal object of this invention is to provide a motor construction whereby the power of an engine may be increased and the operation thereof more efficient by taking care of the calculate from this engine and utilizing the power present within.

Pertaining to Recreation.

MRCHANNEN FOR OPERATION TOY DEB-HICKS—A. Prayersa, 550 W 144th 8t, Man-hattan, N. Y. N. Y In this case the aim of the inventor is to provide a new and im-proved mechanism for operating toy derricks arranged to raise; lower or swing small loads by the use of a motor driven mechanism scall controlled by children, affording considerable ansusement and at the same time providing

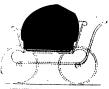


MECHANISM FOR OPERATING A TOY DERRICE

an instructive toy. A boy or other child can readily control the motor by manipulating the reversing here thereof, and also readily con-trol the two handles for operating the detrick with a view to raise or lower the load, to wring the boom up or down or affective or turning the post. A side elevation of the in-vention is shown in the illustration.

#### Pertaining to Vehicles.

ATTACHMENT FOR BABY CARRIAGES
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and width, in accordance with the sign of the carriage body with which it is to be seed. The investion comprises a bottom forms bear ing side here and a cross ban, and unwardly catecoding out sumbore that curve investiga-tion of the comprise of the comprise of the top, the cost and member overhanging at the top, the cost and member overhanging to a greater degree than the cities of the contract of the degree than the cities of the contract in pace, a carriage bedge indicated in doctor disas. The investion can be used on a bed couch or the like.

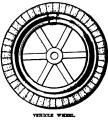
SUPPENSION DEVICE FOR AUTOMO
BILER.—J. P. Wild., 261 Union St., Jesse
(City, N. I. To design the jointing and jarries
supported to the property of the propert



SUSPENSION DEVICE FOR AUTOMOBILES.

are reduced to a minimum, thus permitting oc-cupants to travel with the greatest degree of comfort even when rubber these are not used. The illustration herewith shows a front view of an automobile showing the auspendon frame in place between the vehicle body and the front axis thereof.

in place between tes resucces over control and the reference of the result of the resu



held between the sides of the rim to be slid late position, the tire sections being inpro-duced through an opening in one of the sides of the rim which is normally closed by a door hinged to the rim. A side elevation of the invention is represented in the engraving.

Noze —Copies of any of these patents to furnished by the SCHENERFIG AMBRICAN ton cents each Please state the name of patentse, title of the invention, and date this paper.

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#### ching of the Battleship "New York"

Dakota," and so on. As we have said, the principal difference between the "New York" and the "Wyoming" is found in the armament. The new 14-inch gun is an extremely powerful weapon and a great advance upon the 50-caliber 12-inch great duvance upon no occanoer zennoer gun of the earlier ship. The increase in dimensions and power over the 12-inch type is as follows: Length, 54 feet, as against 51 feet; weight, 683 tons, as against 62,1 tons. The velocity is less by 300 feet, being 2,800 feet per second at the muzzle, as against 2,900 feet, but the shell has four up in weight from 870 to 1,400 pounds, and the muzzle energy has risen from 51,644 to 65,687 foot-tons. The extreme range has fallen from 24,000 yards to 21,000, a matter of no significance, as this ange will never be used in practice. The enetration at 10,000 yards is about the same, being 15.6 inches through Krupp armor for the 12-inch guns and 15.9 for the 14-inch guns. The greater power and effectiveness of the 14-inch piece is due chiefly to the very large bursting charge of high explosive contained in the shell, and the larger number and greater total weight of the flying fragments. Three or four effective hits, with penetration. out of a salvo of eight or ten 14ch guns would go far to settle the fight either by immediate disablement or such damage to the ship and demoraliza-tion of the crew as would prevent the enemy from doing effective work during the rest of the engagement.

An interesting fact concerning the "New ork" and the "Texas," is that they are NOTE" shu the "lexus," is that they are both propelled by vertical, triple-expan-sion engines. This type of motive power was decided upon at the time when the efficiency of the steam turbine had not ched the point which it holds to-day; for the introduction of reduction gear seems in a fair way to solve the difficulties of the turbine marine drive. It is likely that the "New York" and "Texas" will be the last ships of our Navy to be

driven by reciprocating engines.

The "New York" is protected by 12-inch Krupp armor on waterline and gun posi-tions. The secondary battery consists of twenty-one 5-inch rapid-fire guns.

#### Aerodynamic Experiments of Duc de Guiche (Concluded from paye &

the front plate of the car, and when running it was seen that the streamer kept quite parallel to the car's direction, show ing that there were no rising or de ing currents at that level.

The inventor used a method by which he was able to take a very accurate record of the air pressures upon different points of the surface of the plate. The pre at any given point was obtained by using a small open tube which ran through a hole in the plate and lay flush with the surface. The tube was connected by a rubber tube to a pressure gage placed on the automobile. After trying various kinds of gages, he settled upon a simple U-tube partly filled with liquid and having the rubber tube attached to one branch, while a scale placed in the rear served to show the pressure by the rise of the water column. By narrowing up the tube in the bent portion it was possible to use distilled water for the gage with-out any marked vibrations due to the running of the car, thus avoiding the use of glycerine or other heavy liquids.

One of the most ingenious devices is the one which was used to take photographs of the pressure gage records. What is desired is to find the pressures along one line of the test plate at the same time, and by using eight separate holes and tubes along one line he could obtain eight records in a single run of the automobile and was sure that the the automouse and was sure that the working conditions were stways the same. An instantaneous photograph of all the eight gages in line was taken, at the moment when the automobile passed the line, and a parameter, stopped was three for-

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Issue of December 7, 1912

# The Grand Central Terminal

Illustrated by Jules Guerin

There will soon be opened in the city of New York a gateway that leads into the heart of the western world's greatest city, a gateway that symbolizes the peace-making work of the engineer and the changes that he has wrought on civilization.

To Mr. Jules Guerin, one of the most distinguished artists of our time, has been intrusted the task of presenting the symbol. He has made for the SCIEN-TIFIC AMERICAN two masterpieces-one of them a colored cover, in which the station is shown looming up mysteriously in the night, illuminated from within by its own myriad lights and from without by the welcoming lights of the metropolis He has also pre-pared a double page drawing of the "Terminal City" a drawing in which the brush and pencil have explained better than mere words can explain it.

The engineering side will be treated in the usual Scientific American way be the story of the work Few realize that in the Main Station alone there are approximately 28,930 tons of steel; that the total excavation amounted to 3,094,750 cubic yards; that there had been removed up to May 1st, 1912, 203,925 carloads, which would make a train reaching from New York City to Omaha; and that to blast out the 2,000,000 tons of rock, 730,000 pounds of dynamite have been used Then, too, there is the story of the tracks, how they are connected with the subway, how they have been laid underground tier on tier, and how the whole station has been planned so that it would be not an eyesore, but an architectural adornment to a great city.



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nished. One of our views shows the eight tubes leading from the test plate to the box containing the pressure gages. In the box is an illuminated scale and a camera for taking the record, and the camera for taking the record, and operator works the shutter while the au-tomobile is between the rubber tubes on the road. Added to the series of gages to an extra gage with both ends free and is an extra gage with both ends fr having the water columns both at the having the water columns both at the same level, in order to serve as a check and to enable one to make any slight cor-rections for the movements of the liquid when on the road.

By taking the pressures along various lines of the test plate, a chart is obtained which shows the pressure all over the plate. The method employed by the Duc de Guiche appears to be one of the mos accurate yet employed for such experi

#### The Bushmen of Africa

(Concluded from page \$70.)

not so finished the obvious inference is that the artists had not the same leisure in which to do them—probably being harassed by enemies or having to make long journeys to replenish their food supplies. Under the to represent their root supplies. Under the more adverse circumstances their unique mural decorations were not so perfect in detail. The markings on the animals, if not reproduced in their actual colors, have nevertheless been defined with striking clearness by the rude painters with the meager means at their command. Mr. Thomas Baines, F. R. G. S., the celebrated South African traveler, has held that the coloring was done with a feather; but in Dr. Elmore's opinion the extreme finences of many of the lines effectually combate this on many of the intested extends counter that contention, and that a people able to execute such paintings would make brushes by binding together bristles plucked from dead animals.

Etching on parts of the rock is also shown men, and with a truly astonishing degree of skill. Such work is found on the flat, smooth rooks in different parts of the colony and exposed to the weather; but seldom are paintings and etchings to be seen together.

At Vryburg, just before entering Mafe-ing, are some fifty or sixty etchings, each Dr. Elmore states, magnificently One of them, a giraffe, over two over two feet in height, is a really beautiful specimen, and near it are outlines of hippo and cland. A somewhat striking difference between

the etchings and the paintings (although ooth are always found in profile) is that in the former the eye of the animal is distinct whereas it is almost invariably non-existen in the latter

Having obtained a thorough insight into the subject of the Bushmen paintings so far as South Africa is concerned, Dr. El-more has left fo Australia, for he has learnt that the aborigines there also decor ated their dwellings with quaint colore drawings. From the Commonwealth, after careful investigation, he proceeds to the United States, and then directly for Arizona, to study the primitive etchings in that district. His object is to ascertain whether any connection between may reasonably be deduced.

#### The Heavens in November (Concluded from page 871.)

Pleiades, and is well placed for ob tion, being in opposition on the 23d. His rings are now seen widely opened, and he is a splendid telescopic object.

His largest satellite, Titan, appears of magnitude 9.4, and is therefore visible in any telescope exceeding two inches in aperture. The next brightest satellite, any tenescope exceeding two manufacture. The next brightest satellite, Rhes, is of magnitude 10.8, and, if isolated, might be seen with an aperture of 2½ inches; but, being near the planet, an any inches; out, being near the planet, an aperture of 3 inches will probably barely show it. The next two satellites (counting inward toward the planet) Dione and Tethys, are of magnitudes 11.5 and 11.4. and require fully 4 laches sperture to show them. Titan, whose period is very nearly 16 days, may be found on the west of fature on November 3d, south on November 7th, east on the 11th, etc. Elsen, Office efficiency and economy are not the only bene fits derived from the use of

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whose period is 4 days 12 hours, is east of the planet at 3 A. M. on the 8d, 3 P. M. on the 7th, etc. The observer with an as-tronomical telescope will, of course, re-member that it "inverts" the object under observation, so that the satellite will ap-pear east of the planet when really west

Uranus is evening star in Capricornus now pretty low in the west. Neptune is in Gemini, and comes to the meridian about 4 A. M

The Moon is in the last quarter at 9 P. M. on the 1st, new at 7 P. M. on the 8th, in her first quarter at 4 P. M. on the 16th, and full at 9 A. M. on the 24th. the rota, and rull at 9 A. M. on the 24th. She is nearest us on the 3d, farthest away on the 16th, and nearest again on the 28th. She is in conjunction with Mars on the 8th. Mercury on the 16th, Jupiter and Venus on the 11th, Uranus on the 14th, Saturn on the 24th, and Neptune on the 24th, and Neptune on

Princeton University Observatory.

#### Panama Exposition Postage Stamps

THE Postmaster-General recently in approving the designs prepared by the Bureau of Engraving and Printing for the special issue of postage stamps to commemorate the opening of the Panama Cannl, directed the 80,000,000 one cent, 150,000,000 two cent, 8,000,000 five cent and 5,000,000 ten cent stamps be prepared, and that they be placed on sale beginning January 1st. 1913.

The series comprises four denomina-tions, as set forth above. The stamps are tions, as set form above. The stamps are about three fourths of an inch high by one and a sixteenth inches wide; at the top appear the words "U. S. Postuge" and "San Francisco, 1915," in the left hand border is a branch of laurel and in the right hand border a palm branch; a numeral expressing the denomination is shown within a circle in each lower cor-ner, with the word "cents" between The one-cent stamp is green and in the center appears within a circle, a bust of Balboa, discoverer of the Pacific Ocean, looking to the left, and wearing a cuirass and a helmet with a plume. On either side of the background are palm trees with the ocean in the foreground. Below the portrait, in a horizontal panel breaking the circle, are the words "Balbon, 1513."

The two-cent stamp is red. It repre the Gatun locks of the Panama Canal, with a merchant steamer emerging from one lock and a warship in the other The mountains of the Isthmus appear in the distance, and palm trees on the right hand side of the locks. Beneath the picture are the words "Gatun Locks"

The five-cent stamp is blue, and presents the Golden Gate of San Francisco harbor, with the setting sun in the background with the setting sun in the background and a steamer and a suiling vessel in the bay. The words "Golden Gate" appear blow the picture. The tencent stamp is dark yellow. The subject is "Discovery of San Francisco Bay." from a painting which represents the discovering party looking out upon the distant bay. All of the new designs are fine examples of the

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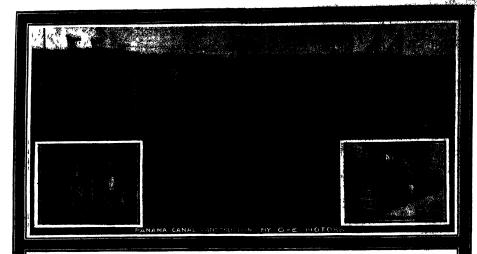
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# Why Electric Power Was Selected

Flectric power is playing an important part in the construction of the Panama Canal It will be used to operate the completed canal.

A glance will show the magnitude of the completed canal and also

A glance will show the magnitude of the completed canta and also how and why electric power is being used.

The Panama Canal is ranked as the greatest engineering feat the world has ever undertaken. It will be 50 miles long and vary in width from 300 feet at Culebra Cut to 1000 feet at Gatun Lake. Three locks at Gatun rase its level to 85 feet above the sea, one at Pedro Miguel lowers it 50 feet and two at Miraflores 55 feet more to sea level at the Parkite and level at the Pacific end

**Building the Canal** 

Water for a large part of the hydraulic excavation and fillings necessary for the canal and mammoth Catum dam has been supplied by pumps driven by electric motors

Both here and on the Catskill Aqueduct G F motor driven pumps have proven absolutely dependable even though working under adverse conditions Each motor can be controlled by push buttons from remote locations if desired This system requires but a small part of one attendant as time and does not draw upon the supply of compressed air or steam so necessary for drills at the workings. This method of one attendant a time and does not draw upon the supply of compressed air or steam so increasary for drills at the workings. This method of operating pumps has proven so dependable and economical that American criess are using it in water plants. A number of cittes are depending entirely upon electric pumps for their water supply. Practically all the millions of yards of concrete used in the canal construction have been mixed by electric power and in many cases the cement, sand or broken rock has been crushed, unloaded, stored or conveyed by electric cars and G E electric locomotives. Electric concrete mixers can be moved quickly to a new location because of the elimination of all weight not needed for strength, and the absence of a massive boiler. When relocated a simple electrical connection again permits operation with no delay. There, is no waiting to get up steam, no extra weight to drag.

connect: m again permits operation with no delay

There is no evating to get up steam, no extra weight to drag
around a d the motors consume current only when they are working,
thereby effecting power economy. Some of the advantages which
determine the selection of General Electric motor drive in preference
to the old donkey engines are. No water to be carried, no smoke
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watchman. These advantages apply equally well in many cases to s unloaders etc

cranes unloaders etc

On the Atlantic Division the mixed concrete is placed in the
forms by electrically operated cableways which span the enormous
cut or prism necessary for the canal These cableways are
operated with greater speed and certainty by the GE motors and

control devices used than is possible with other forms of motive

control devices used than is possible with other forms of motive power, which unduly tree the operator. On the Pacific Division concrete is placed by electric cranes of fixed cantilever, bern and chamber types as they move in the canal prism. Electric power for all this construction work, the electric lighting and the searchlights used for night work or the Gatun cableway unloaders, etc., is furnished by two Curtis Turbine power stations. Due to the intermittent character of most of the operations used in construction work, the demands upon an electric power station fluctuate, rapidly between quite wide limits. Curtis Turbines give a high economy throughout a wide range of loads and so are eminently fitted for this work. These turbines benefit fully from high secan fitted for this work These turbines benefit fully from high steam ure including superheat

pressure incuding superheat. The vacuum maintained is 28 inches, something not generally considered possible in tropical countries with condensing water of 80° F and upwards. The advantages of the high vacuum used are completely realized. These turbines are constructed to withstand audeen changes of temperature incident to quick starting or to variations in superheat while running.

Permanent Operating Equipment

The entire operation of the canal will be by electric power furnished from a water power plant at the Gatun Spillway and from the Miraflores troin a water power paint at the channil spinway not from the shirances. Curtis turbine section which will be maintained as steam auxiliary. Electric power permits the control of all machinery at each group of locks from one lookout tower. The great flexibility possible from its use was the prime factor in determining the selection of electricity.

as a motive power

as a motive power

The windings of the generators used in these stations are thoroughly protected from the effects of the most tropical climate, by high grade insulation which was specially developed for the extreme conditions prevailing on the Canal Zone. They are built to run very cool and have the perfected G-E design features which are found in many of the largest power stations of the world.

Over a thousand electric motors will be used to operate the locks, gates, dams, gate protecting chains and to tow the ships through the canal by electric locomotures. Four posperful electric locomotures will move each ship through the canal. A sample locomotives will move each ship through the canal. A sample locomotive is now under construction by the General Electric Company.

All the range lights will be electrically lighted, and the telegraph, telephone, fire alarm system and mining batteries offer additional opportunities for electricity to demonstrate its reliability.

Thus all the electric power used for building the canal and operating it when finished will be furnished by generators built by the General Electric Company. Practically all the electrical equipment purchased for the permanent operation of the Panama Canal was furnished by the General Electric Company.

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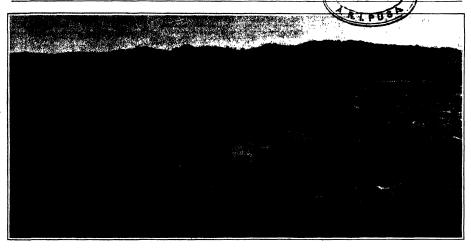
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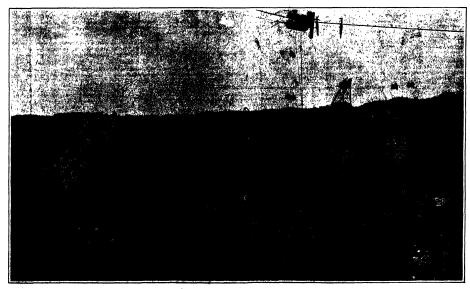
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Gatua Dam-General view from water tower, showing south center approach wall, forebay of upper locks, the dam in process of construction, and the lake forming above the dam.



Constructing sidewall monoliths of the upper lock, Gatus. The concrete was placed between steel forms, movable on tracks laid on the floor of the locks,

THE GATUN DAM AND LOCKS.—[See page 886.]

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The purpose of this journal is to record accurately, nply, and interestingly, the world's progress in scientific owledge and industrial achievement.

#### The Man

It speak elsewhere on this page of the special appliances which have contributed so greatly to the entity constitutes. appliances which have contributed so great-ly to the early completion of the Panama But what about the "man behind the" machine? tter how great the excellence of an engineering plant, its output may be easily cut down by inefficient handling and a faulty organization of the working force. It took nigh upon forty thousand men to build force. It took mgn upon many consequences are scattered few were unities of the soil. Literally, this was an army of invasion, earlying its attack into a country strouted two thousand miles from its base. Not alone stunted two thousand miles from its base. Not alone the men themselves had to be carried to a far distant and unfavorable field, and strewn out on a working front fifty miles in length, but with them had to be carried practically the very homes in which they were ed; and day by day the commissuriat and quarter-ter's department have had to forward from the United States, and distribute, the food and general supplies necessary for their maintenance at the front. In view of these facts, shall we be stretching the point too far when we say that the conquest of the 1sthmus of Pananan is a feat of the arms of peace, as brilliant and as difficult as any ever accomplished by the arms

Continuing to speak in the terms of our analogy, it must be admitted that in its opening days, the cam-paign was not marked by that brilliant success which has distinguished its later phases. The period of civilian control was marked by doubt and disappointment Wallace and Stevens, engineers of brilliant achievement, were boset with many difficulties, of which not a few were quite unnecessary. Chief among the latter was the hampering system of control, largely from Washington, which left these men without that absolutely free hand which is necessary for the successful execution of a work of this difficulty and magnitude To both of these men, and particularly to Stevens tune to both or these men, and particularly to stevens, be credit due for working out a plan of organization which has contributed ingely to the success of the work. But there was a lack of co-operation and absolutely unhumpered central control which, if it did not threaten the ultimate success of the work, certainly threaten the ultimate success of the work, certainly promised to extend the time of its execution to an un-conscionable length. The resignation and return to the l'inited States of two civilian chief engineers in rather close succession presented an emergency which It took the clear insight and quick indepent and action of ex-President Roosevett to grapple with successfully. He decided to place the whole work under army control, and thus subject it to an iron discipline against which there could be no appeal. Fortunately, he found in the Corps of Engineers of the army a highly experi body of men, who were girendy possessed of wide ex-perience in works of civil engineering of a character merally similar to that at Panama Need we go any orther in this historical review? The fact that the canal will be ready for traffic over a year ahead of the time appointed, tells the story of the army's success-ful handling of this, the world's greatest engineering

In spite of some belated critisism, to which we do one of the finest recomplishments of the Japanese bespie in the war with Russia, was their successful handling of the problem of sanitation this more peaceful but not less difficult campaign at Panama the cleaning up of the Canal Zone, and the extirpation and control of tropical fevers, as carried out under Col. Gorgas, must sver be considered as great an accomplishment in the field of sanitation as is the actual digging of the causi in the broad field of engineering. Not alone did the work of Col. Gorgas of engineering. The total solution is the work to the construction of the canal, but they have given an object lesson to the tropics in bentiful living, whose benefits will be felt throughout the whole beit of the equatorial zone as long as time endures.

It was fortunate for the success of the enterprise that when Col. Goethals was placed in control as chairman of the Isthmian Canal Commission and chief engineer of the work, he was allowed to have such absolute control that he has himself spoken of his rule as

a "benevolent despotism." To the vast advantages of army organization and discipline Goethals added all the force of an unusually strong personality. His enthusiastic devotion to the enterprise, coupled with a magnetic personal interest in the working force, have found a quick response among the men—engineers, me-chanics and inhorers alike, who have so loyally coerated to push the great work so rapidly to its com-

#### The Machine

THE predicted completion of the Panama Canal some fifteen months earlier than the date originally estimated, is a distinct tribute to the efficiency of American labor-saving machinery as exemplified in the steam shovel, the plow unloader, and the high-speed cableway. Other labor-saving devices, it is true, have contributed to the great result; but so far true, have contributed to the great result; but so far as the mechanical appliances at the canal are concerned, the three named above stand out as glants among their feilows. Outside of the problem of annitation, the solution of which when the United States took hold of the job was Immediately recognized as imperative if the canal was ever to be built, the difficulties of the task were rather those of quantity than of quality. In apite of much that has been said to the contrary, In apite of much that has been said to the contrary that the carried way of our occupation, when the table way of our occupation, when the to say that the construction of the canal at Panama was fairly bristling with engineering difficulties of a new and altogether untried character; it is ties of a new and altogether untried character, it is a fact that, judged from the engineer's standpoint, the work at Panama differs from the general run of the work at ranama unners from the general run of hydraulic and excavating problems in the United Nintes only in respect of its magnitude and of the trying climatic conditions under which it is carried on. In one respect indeed, that of financial backing, the work of the builders of the canal has been rendered. the work of the uninces of the canal has been rendered much ensire than demiliar work of an engineering char-acter as carried on at home. Requisitions for men-materials, and money have met with instant and lib-eral response from Congress; and just what this means will be well understood by those engineers who have had charge of important contracts, city, State or oth wise, in which the element of rapid construction was

given prime importance.

At the very outset of the work, it was realized that the two controlling sections as regarded the time of completion were the Culebra cut and the locks and dams at Gatun. The former was a question of rapid excavation and speedy and uninterrupted disposal of the spoil. The latter was a question of the rapid handling, mixing and laying in place of the largest amount concrete that had ever entered into a single job of this character. It was predicted, at first, that the cut would be finished before the locks, and it was believed that the latter could not be completed in time to allow of an earlier opening of the canal than January 1st, Because of the unprecedented dimens locks, the engineers realized at once that existing cable norm, the engineers reason at once that cannot be ways and other means of transport possessed neither capacity nor speed commensurate with so great a task. The old designs which had done such good work on the Chicago Drainage Canal were redrawn and dis sions and speeds were greatly increased. The work of concreting was no sooner in full swing, than it became evident that the locks would be finished a year or two before the date originally set. With the new handli facilities, the rock, sand and cement and mixed or crete were swung to and fro in mid-air in buckets of three to five tons capacity and at speeds of twenty miles an hour and over. In a single day, and for days together, an average of three thousand yards of con-crete was laid, the total on more than one occasion reaching four thousand yards.

What the cableways accomplished d at the locks in expediting the work was equaled if not surpassed by the work of the steam shovel and the plow unloader at Culebra cut. Not only were the largest shovels capable of taking out five to six tons at a scoop, but these machines were pushed closer to the limit of their endurance than is ever attempted in the United S e time element was the controlling factor. of heavy overhead charges, it was realized that wear and tear of plant was a small consideration where months and even years of time could be saved.

The problem of disposal of the excavatile was as great as, if not greater than, that of digging it out, and from Culebra alone 160 haded trains per day, ont, and from Cutslers alone foll binded triving upon the involving the services of 110 becomedites and two bloomends and, were hauled to the deums, a distance from one to thirty-three miles from the point of steart-tion. Here, that other ingenious farenchon, the plow-unloader, performed admirable services. Trains of twenty-one cars, carrying six hundred tone of material, were swept clear of their loads in from four to, six minutes time. Such methods of diagras, leading and unloading, coupled with a most sdarable track layout, soon showed their effect in the total yardage halled; and it was not long before the material was being dug out and dumped at the rate of from 3,000,000 of 4,000,000 cubic yards per month. Had it not been for the unexpected developments of the alldes, the whole of the executation in the great cut would have for the unexpected averagements of the success the whole of the excavation in the great cut would have been finished at the beginning of the present year. The steam shovel, the dirt train, the unloader, and the overhead cableway have established a record for the Panama Canal which will probably remain for many

#### The Proof of the Pudding

O the bacteriologists of the Bureau of Chemistry, we commend a paper which appears in the Journal of the American Medical Association for October 28th, 1912, from the pen of Dr. W. T. Sedgwick, the professor of Biology and of Public Health in the Massachusetts Institute of Technology. We are aware that this suggestion is not likely to be received with enthusiasm; for Prof. Sedgwick has long immense possibilities in cunningly twisting Dr. Sedg-wick's article on "The Fallacy of Testing Food Ma-terials by Animal Inoculation" into a hearty recom-

terials by Animal Inoculation" into a hearty recom-mendation to esting rotten eggs and a splendid indorse-ment of putrid food in general.

The point that Dr. Sedgwick makes in his paper is simply this: A food is not necessarily unfit to est because, when injected hereafth the skin, it may kill an animal. Although Dr. Sedgwick does not say it, we have no doubt that subcutaneous injections of many pure foods would prove fatal to lower animals. Every physician knows that a quantity of morphine which, taken hypodermically, would kill very quickly, can be swallowed with impunity. The toxins of diphtheria, tetanus, typhold, and other infections act either comatively feebly or not at all when taken by the oth. So, too, the germs of lockjaw and anthrax, two of the worst diseases that afflict the human race can be eaten; but they may not be injected with the hypodermic needle without incurring terrible results.

In face of all this, in face of the fact that th in nice of all tais, in face of the fact that the purity and substity of drinking water is no longer determined by injection, "certain Government indevelopments," as Pro. Sedgwick cuphensistically refers to the Bureau of Chemistry's needlo-scientista, seek to rerive this discredited "test"—not only for water, but for eggs, opsiers, ice cream, golutines, and other conference of the purity of the purity of the conference of the purity of the purity

Prof. Sedgwick is probably the last man who would advocate the eating of decomposed eggs, or would him-self prefer a cold storage egg to the "newly laid" of the barnyard fowl. But he cannot refrain from arguing partyard row. But he cannot retrain from arguing that the long experience of the trade and of consumers of eggs, particularly of those bakers who have used cold storage eggs in pies, cakes, and custards, without perceptible injury and with results no different from those obtained with fresh material, should not be brushed aside in favor of the data obtained by a scanty and questionable experimentation which consists not ding animals as man is fed, and not after co ing the food, but in directly injecting large amounts of the raw and uncooked substance beneath the skin or into the delicate peritoneal cavities.

The alimentary canal is very ingeniously designed. Special walks prevent the absorption of the undesirable components of foods, leaving to the intestines the task components or room, leaving to the intestines the task of casting them out. Not only does cooking profoundly affect food, destroying as it does most bacterial life, not only does the stomach chemically change tood, raw early does the stomatch chemically change food, raw as well as ecoted, but the direct injection of raw food into the body beneath the skin becomes, as Prof. Sedewick says, "a crude and swere procedure, a kind of rough surgical interference, totally different from the normal radium of the same materials into the body by way of the food tube—perhaps already cocked." To way of the food tube—perhaps already cooses." In determine the fitness or uniforms of an egy or an oyeser it must be swallowed. The proof of the pudding, in other words, lies in the esting. If an animal dis-because it has been inconluted with food, no scientific light is shed on the purity or heathfulness of the material injected. Resides, a vast quantity of fand is destroyed which in these days of the high nest of living and the material injected. can ill be spared.

## Fortifying the Canal

#### A Legal Right and a Matter of National Expediency

By Henry L. Stimson, Secretary of War

WHEN President Taft first urged upon Congress the necessity of fortifying the canal, criticism was made that such action would be a breach of our ations to Great Britain under the Hay-l'aunce-treaty. The publication, however, of the correspendence between Mr. Hay and Lords Pauncefote and Lausdowne completely silenced this criticism; and I do not think that our legal right to fortify the canal is now seriously questioned. It may, never well to summarise briefly this legal situation.

I. Our Legal Right to Fortify the Canal. In the Clayton-Bulwer treaty of 1850 the United States and Great Britain expressly agreed not to fortify states and Great Britain expressly agreed not to forthy or assume any dominion over any part of Central America where the canal might be made. The first draft of the Hay-Pauncefote treaty of February 5th, 1900, contained a similar prohibition to the effect that "no fortification shall be erected commanding the canal or the waters adjacent." This proposed treaty in this form was rejected by the Senate for the very reason that it did not give the United States sufficient liberty of action in regard to the canal. The present Hay-Panneefote treaty was then negotiated, which in its first article entirely abrogated the old Clayton-Rulwer treaty, and also omitted the restrictions against fortifi-cation which had been contained in the first proposed Hay-Pauncefote treaty.

The memorandum which Mr. Hay sent to the Senate with the second Hay-Pauncefote treaty, containing the correspondence between himself and Lords Pauncefote and Lausdowne, shows that these changes were made for the express purpose of permitting the United States to fortify and defend the canal, and that Lord Lansdowne fully understood and recognised this right on our part. As to this, Lord Lansdowne expressly said:

"It is most important that no doubt should exist as to the intention of the contracting parties. As to this, I understand that by the omission of all reference to the matter of defence, the United States Government desires to reserve the power of raking measurement. the matter of detence, no linked states dovernment desires to reserve the power of taking measures to pro-tect the canal, at any time when the United States may be at war, from destruction or damage at the hands of an enemy or enemies."

The Congress of the United States then proceeded the following year in the Spooner act (Section 5) to authorize the President to enter into the contracts for the construction of the canal and its "defences." in the following year, 1908, Mr. Hay, the same states-man who had negotiated the Hay-Pauncefote treaty, negotiated a treaty with the Republic of Panama by which Panama granted to the United States for the purpose of the canal the use, occupation and control of the present Panama Canal Zone, and also granted to the United States for the protection of such canal. ht to use its land and naval forces and to estab fortifications. (Bunau Varilla treaty, Article

The Hay-Pauncefote treaty and the Bunau Varilla The Ingranucone treaty and the Bunkar variate treaties are the only existing treaties entered into by the United States which affect its rights over the Punama Canal. It is perfectly clear, therefore, from the foregoing facts, that none of the statemen, either of Great Britain or Fanama or the United States, who were concerned at the time in the negotiation of these treaties or the enactment of legislation to make them effective, had any doubt as to the right or purpose of the United States to defend and fortify the canal.

# II. The Necessity of Fertifying the Canal as a Matter of National Expediency. There has also been much misconception as to the

expediency of fortifying the canal as a national policy. It has been earnestly argued that the safety of the canal can be better and more cheaply assured by an agreement between the leading nations, making it a agreement between the leading nations, making it a neutral watervay and forbidding it from over being blockaded or seized in time of war. It is argued that such a course will relieve us from the expense and burden of defending the casals, and that it will at the same time accompilate every result which we could accompilab by defending it ourselves.

This is an entire miscuoception. It loses sight of the vital difference between an American canal and

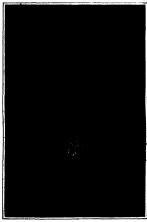
the vital directors between an American cann are an international canal. It losses sight of the fact that it is of vital importance to this country not only that the canal shall be open to our fact in case of war, but that it shall be closed to the fact of our enemy. An aternational canal, kept open and defended by agreement between the powers, from its very nature would

have to be open to our opponent as well as to ourselves Let us look into this a little more in detail. The Panama Canal, when completed, will shorten the dis-

Sugar.

Marie Comment

tance between our east and west coasts from 13,000 miles to 5,000 miles. The long peninsula of South America, stretching down nearly into the Antartic an, offers an almost insuperable obstacle, not only to the transfer of our own fleet from one coast to an other, but to a similar transfer of an enemy's fleet In these days of dependence upon coaling stations, it would be almost impossible in time of war for the fleet a nation to which such stations were not available to pass around that long and sparsely inhabited coast Thus, the populous cities in our custern coast are almost absolutely protected against sea raids from an enemy in the Orient. And similarly the great cities of our western coast are protected against the forays of a European fleet. To a peaceful national like our own. maintaining a very small regular army, this condi-tion is most important. In case of war it enables us ntrate our entire defence upon the threate side, and it thereby tends to give us the absolutely necessary time which will be required in order to create and train a citizen army. Our regular army is insufficient in size even to protect adequately one frontler If it had to cover two, its efficiency would be reduced



Photo, by Pack Bros.

by half. The three months which would be consumed by a foreign enemy in going around Cape Horn, or through the Straits of Magellan, might make the difference between a successful defence or complete disaster on the part of those communities against which the

On the other hand, if, in case of war, ou fleet were free to pass through the Isthmus of Panama and to transfer its activities from coast to coast at will, we should be in a very much more defend position than we are to-day without the canal. That very possibility would make necessary additional expenditures on our military and naval establishments which would far exceed the cost of fortifying the canal.

It is this feature of the canal which has been almost rholly lost sight of in the discussion as to fortifica-We have all been quick to realize the immer naval advantage which the canal is to ourselves. Ever since the voyage of the "Oregon," we have all readily seen how the existence of the Panama Canal in case seen now the existence of the l'annua canal in case of need may be equivalent to doubling the size of the American fleet. We have not borne in mind the similar advantage which the canal, if open, would be to our esseny. We have not remembered that it would the tremendous protection which the continent of South America is to us at the present day. have not remembered that it would be almost as long a step toward depriving us of our insalarity, and

bringing us into the embrollments of European and Oriental nations, as the invention itself of steam navi

sting to follow in the development of the treaties and legislation in respect to the canal, how trenties and regionation in respect to the cuma, now slowly this idea developed even on the part of those responsible for the government of the country. In 1850, when the Clayton-Bulwer treaty was negotiated, the paramount interest of the United States in the proposed canal was not recognized in the treaty. Our Pacific Const had only just been opened for settlement The whole structure of the treaty admitted an equal the store of the part of England with ourselves in the canal. The treaty expressly provided that, even in case of war between Great Britain and the United case of war between Great Britain and the United States, the waterway was to remain open to both belligerent parties. The great development of the United States as the dominant western power, and its modern supreme interest in the Caribbean Sea, were apparently und.camed of

Even in 1900 the first draft of the Hay-Pauncefote

treaty failed to grasp and define this cardinal fact. While that treaty paved the way for this country to incur the expense of building the canal, it did not secure the vital quid pro quo which that expenditure merited. It did not take the decisive step which made it an American rather than an international canal We owe it to the Senate that this result was finally secured, and that Great Britain was brought to recog nize that while the canal was a great commercial convenience to the rest of the world, to us it was a vital military asset. That this recognition was clearly and frankly and cheerfully made is evidenced by Mr Hay's notes of the negotiation subsequently transmitted to the Senate, in which he says, in respect to the omission from the second Hay-Pauncefote treaty of the words, "in time of war as in time of peace;"

of the words, "In time of war as in time of peace."
"No longer, blooding upon the language of the Inwise
amendment, which had in terms reserved to the United
States express permission to disrepard the rules of
neutrality prescribed, when necessary to secure its
own defence, which the Search had apparently deemed
some defence, which the Search had apparently deemed
cannal should be free and open in time of war as in
time of peace's would dispease with the
war as in time of peace' would dispease with the
servers of the three control of the words. In time of
search of the control of the words, in time of
search of the consistency would have the whole
States and any other power, would have the ordinary
effect of war upon treaties when not specially otherwise provided, and would renth both parties to their
original and unitural right of self-defence, and give to
augustat the other helliground and to protect it and
defend itself by whatever means might be accessary."

The foregoing considerations show the vital relation of the canal to the interests of the United States, and bring out the force of the remark of President Hayes in his special message to Congress, dated March 8th, 1880, that the canal will be "triumly a part of the coast line of the United States"

As a matter of fact, it is far more vital than any

particular portion of the coast line or any seaport, however important, because it is the key to the protection of many scaports and thousands of miles of coast line. It is far more vital to us than the Swez Canal is to Great Britain, because the Suez Canal affords communication not between the integral parts of the British Isles, but between those Isles and India, an alien nation, and a slightly shorter route to Australia, a colony, than is afforded by the route via the Cape of Good Hope. England possesses, moreover, numerous well defended bases and coaling stations on the route to southern Asia via the Cape of Good Hope, so that the closing to her of the Suez Canal would not interrupt her water communication either com-mercial or military even with India. The relation of the Panama Canal to the United States is far more analogous to the relation of the Kiel Canal to Germany; yet even here the analogy is not complete, for important as the Kiel Canal is to German commercial and military interests, its interruption or seizure by an enemy would lengthen the sen route for German els by only a few hundred miles instead of

Assured control of so vital a possession is evidently an indispensable condition of our national security. In determining the measures which will be found most effective to accomplish this result, we naturally turn to a contemplation of the means and measures which have been employed almost invariably throughout the

(Concluded on page 339.)



Upper lock gates; Gatun Lake water in foreground.

## The Gatun Dam and Locks

By Lieut.-Col. William L. Sibert, Corps of Engineers, U.S. A., Member 1sthmian Canal Commission, Division Engineer Atlantic Division



Piers, west wing wall, which will break up wave action.

THE first authoritative recommendation for build-ing a dam across the valley of the Chagres at Gatum was made in the minority report of the Board of International Engineers, convened by the President of the United States for the purpose of studying and making recommendations concerning the best type of report recommended a lock canal with a lake 85 feet

above the sea, formed by the Gatun dam.

The Chagres valley at this place is 7,920 feet wide, including a hill in the center in which existed sultable rock for founding a concrete dam for a spillway Geologists state that the Gatun dam site was, at one 300 feet higher than now, and that during the period of this elevation the Chagres River cut gorges hrough the site toward the sea; one on either side of he Spillway Hill. After the subsidence referred to, the Spillway IIII. After the subsidence referred to, the dam site was built up, evidently in an arm of the sea; portions of this sedimentary fill being of the finest The low elevation of rock in these old practically precluded any other type of han an earthen one. The supporting powthan an earthen one er of the material underlying the proposed ear dam was not definitely known at the time of the submission of the minority report referred to above, and a section was recommended in this report, which presumed that there was a hard bottom underlying the lake face of this section

An early study of the material available for hydran An early study of the material available for invaria-lie fill in the dain left of the belief that the slope on the lake face should be flattened in order that the hy-draulic material might be stable when placed. This led to the first proposed change in the section of the dam, which was to construct a rock ridge at the toe of

the lake side, of such height as would insure a slope of about one fifth from the top of this rock ridge to a reasonable height above the lake level. Work on other parts of the canal soon gave rise to the thought that another, and probably a controlling, element should enter into the design of this section; that element being the bearing capacity of the material underlying the dam. It was finally rial underlying the dam. It was finally thought that the best and most economical section for the dam was probably one of uniform slope on both faces, thus makof uniform stope on normalization or ing no violent change in the loading on the constant of the foundation. The crosssection on the adjoining page approxi-nates that condition, and is the section now tentulively adopted. The original height proposed for this dam was 135 feet above sea level. The approved height is 115 feet above sea level, while the tentative height to which the dam is being built is to be not less than 105 feet above son

#### Construction.

The first operation in the building of the dam was to stop the flow of the Chagres River through its old channel react to the locks and through the old French canal, forcing the entire flow through a channel known as the "West Diversion," west of the Spillway Hill, (See general plan of the dam) Tresties were then constructed on the 30-foot con-tour on both faces of the dam, and waste rock dumped by trains from such trestles, forming embankments between which the hydraulic material was pumped (See No trouble photograph.) ered in closing these two channels; both they and the west divorsion channel being at sea level. After the accomplishment of this, the excavation of a channel through Spillway IIIII and the construction of that portion of the dam between Spillway Hill id the lock site, were commenced.

As the work progressed, and the dry fill commenced

to overlap the underlying hydraulic fill, an effort was made to give such dry fill a face of about 15 feet above the wet fill The thought was that this height of material, with loaded trains running over it, would compact the hydraulic fill and force to the center any very soft material, the softest of which would be taken out by the drain pipes. These drains (20-inch pipe), the function of which was to remove the sur-face water from the hydraulic fill "pond," were placed in such a way as not to endanger the stability of the dam. By varying the depth of the "pond" a greater or lesser amount of the finer clayey material could be

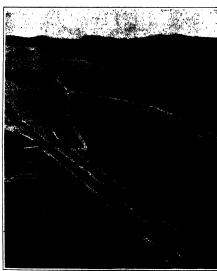
One of the greatest construction difficulties has been the excessive amount of clay in the material available for the hydraulic fill. An excess of clay makes a water-tight fill, but such a fill drains itself very slowly, and, consequently, remains soft for a long time and increases the difficulty of making the overlying dry fill. An excess of clay also means that the slopes of the dam must be flat to insure stability in so far as hydraulic fill itself is concerned. The east half of the dam, for a considerable portion of its length, has the dam, for a considerable perform of the season, and been practically completed for some months with every indication of perfect stability. A slow consolidation of the great mass of material forming the dam is going on and will probably continue for some time to come. The lake stands now at about 50 feet above sea level.

The permanent spillway channel, with concrete bot-tom and side walls, founded on rock, together with such preliminary work as could be done on the foundations of the spillway dam proper, was completed on April 24th, 1910, and the work of diverting the Chagres River from the west diversion channel to commenced. The elevation of the spillway channel is 10 feet above sea level, consequently in any attempt to stop the flow of the Chagres and force it through this channel, a rise of about 14 feet of water had to be encountered. The banks and bottom of the west diversion were soft clay. The plan adopted was to drive treaties across this channel on the 30-foot coutour on each face of the dam, and to build, by dumping rock directly into the stream, two dams at the same time, hoping to distribute on such dams the head formed during construction. An unlimited amount of waste rock was available for this work. The banks of waste rock was available for this work. The Bainss of the channels were first made secure by dumpfing rock at the end of the trestles. After the channel was contracted to some extent, a considerable current de-veloped; rock dumped from the trestles was carried some distance down stream, forming a rock apron in some distance down stream, forming a rock aprou in the bed of the stream below the dam. Quite deep holes, however, were dug by the water below this rock apron. When the work on the two dams had rock apron. When the work on the two dams had progressed so that a channel about 80 feet wide and 6 feet deep was left in the center, it was found impracticable to make any headway. Stone dumped from the trestles would be rolled down stream. The rainy season was then about to commence. The lower part of the bents of the trestles being well supported with rock, it was then decided to dump a carload or of crooked rails above the trestles in such a way that they would form an entanglement and stop the rock, thus insuring either the construction of the dam or the taking out of the trestle. By this means the two

dams were finally completed and the Charres River successfully diverted

Before turning the water through the spillway channel, stubs of plers, 20 feet apart, were built of such height that their tops would be exposed in the dry When the work of constructing the masonry dam in the spillway was commenced, these piers were immediately run up to an elevation of 45 feet above ran in to an elevation of 35 Net above sea level and tracks for locomotives, cranes and trains laid on a bridge rest-ing on these piers. Grooves were made near the lake end of these piers into which weighted timber curtains could be lowered by crane, so as to stop the flow of the river. This arrangement gave complete control of the Chagres and allowed the construction force to shut off any portion of it at any time they saw fit. Concrete was dumped between the plers directly from cars, and the lower part of the ogee was formed by dumping it into hoppers and conveying it to place through chutes. The musonry at end of this dam is now to its full height excepting the piers between which the Stoney gates for controlling the lake level will be placed. The central portion of the dam, about 400 feet long, has been built up to elevation plus 50, over which elevation the water will be allowed to run during the coming rainy season.

For controlling the water, partially through the rainy season and entirely during the dry season, during construction, three openings 8 by 18 feet were temporarily left through the heavy masemry part of the dam, and Stoney gates of the same size as those used in the large culverts of the locks placed in these season will soon lower the lake level be



Bird's eye view of Gatun locks, dam, and spillway, showing ships being towed

A cylindrical valve, of type used in the locks, was also placed in this dam imental purposes.

or expectamental purposes.

Gaten Looks.

Religing ships to the lake level portion of the canal, right as 95 feet above san level, is accomplished by dupticing tight of three looks. Each look has a lift of 28 1/8 feet, and will pass ships 1,000 feet long of 40 feet draught and approximately 110 feet wide.

The locks proper are founded on rock and the heavy masonry is completed. This rock foundation was not masonry is completed. This rock foundation was not a sufficient extent, however, at available elevations, for supporting the guide walls. Under that guide walls extending into the lake (see photo on Front page) the underlying rock at the south end is about 150 feet bea level, and the overlying material is soft. This wall is cellular in construction. It is composed of four longitudinal walls about 2 feet thick with cross walls about 17 feet apart, all built of reinforced concrete.

The natural ground underlying the wall was about 8 feet above sea level. On this ground a wide fill with a very flat slope was constructed to elevation plus 35

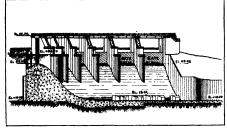
These dredges cut their way into the space where the walls in question are to be built, making a channel just wide and deep enough for their passage. They then widened out the cut and deepened it to 41 feet below sea level. An earthen dam was then built across the narrow entrance cut, shutting off the connection with the sea, and as the dredges worked they were lowered. They are now floating at an elevation of 32 feet below sea level and can remove the material to the depth required. After the excavation is completed it is proposed to have the dredges excavate a mp 65 feet below sea level and lower the water to feet below sea in order to test the stability of the sides of the cut. If there is no sliding the pit will be filled with water; the dredges floated out, the dam across the entrance channel replaced and the excavation unwatered for the construction of the walls first referred to.

In the explorations made by diamond drills to deter-mine the character of the foundations for the locks proper, the entire space was thoroughly covered by holes. After the character of the rock was determined. experiments were made to find out whether or not the eously so that if one gate is broken or damaged there will be a good pair of gates in position, and in addition, there is placed above each set of gates in the upper lock and below the sea gates of the lower lock, fender chains. These chains will be kept in such posi-tion as to bar the passage of a boat into the lock until it is ready for the boat to enter. Then the chain will be dropped into a slot in the floor

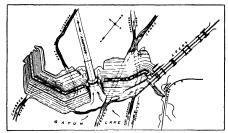
A swing-bridge emergency dam is provided for stop-ping the flow of water through the locks in case all of the gates in the upper lock should be opened or broken, so as to allow the passage of water.

Construction.

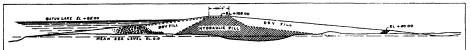
The masonry of the Gatun locks was largely placed by cableways, having a span of 800 feet, covering the entire space to be occupied by the locks. The stone and sand for the concrete were obtained, respectively, 20 and 40 miles down the Caribbean coast, and were brought in barges up the old French Canal as closely as possible to the lock site, and were unloaded by cable ways into large stock piles near the bank. The material, however, was still 3,500 feet away and 60 feet below the center of lock construction. This situation



Section through center of Gatun dam spillway.



General plan of Gatun dam, locks and spillway



Transverse section through Gatun dam, showing the final plan upon which it is being built.



Upper locks at Gatun, looking south toward the lake, showing gates completed



Gatun dam consists of a core of hydraulically-deposited, impervious silt

and through this piles about 60 feet long, 4-foot centers, were driven and a heavy reinforced concrete slab built around the heads of the piles, on which was erected the cellular structure. There was a continual slow settlement of this wall as its construction pro-It was brought to a height of 61 feet at see level through its entire length in order that the settlement might extend over the whole base before any part was brought to full height. At one time it ed an inclination to settle toward the east. This was corrected by pumping water into the west line of pockets and so maneuvering the water load as to make the wall settle vertically. This wall is now full height and stable, and the lake is rising around it, which will

The north guide and flare walls are yet to be built. The north genne and nare wans are yet, to be built. It will be necessary to go to a depth of about 70 feet below asa level through very soft material in order to uncover the rock on which to build the flare walls. Under the guide wall itself the rock is at a still lower elevation, and a pile foundation will probably be constructed, the piling going to rock. The material in this space was no soft to hold up steam showls, and it was decided to do the general excavation by suction underlying material was creviced so as to allow the passage of any material amount of water These ex-periments showed that the crevices in the rock were very small, but that there might be sufficient passage-way to transmit pressure under the lock floors. This resulted in constructing a floor in the upper lock, beresulted in coincipeting a not in the intermediate between the emergency dam still and the intermediate gate that would resist full lake pressure, if received. Behind the remaining lengths of lock walls, drains of large stone were provided, and the corresponding floors made thin.

The operation of these locks differs from the ordinary lock. First: In that ships will not be allowed to enter and leave the locks under their own steam. They will be required to land along the side of the guide walls and will be taken in tow by four electric traction cars (see bird's eye view of locks and dam) and thus taken through the flight of locks. These cars, while under load, will be operated on a rack track; returning light, they will run on an ordinary track except when making the de level to another. Second: Duplicate operating gates are provided at each end of the locks that connect with the lake level. These gates will be operated simultancaused the adoption of a central mixing plant near the central portion of the looks, cond-situm of eight 2-yard mixers. An automatic, electric, loop-line rati-road, each car carrying the material for a batch of concrete, was installed, massing under the cement shed; under the sand and stone piles, and over the mixers The mixed concrete was delivered to the cableways uniring it by an electric line, the flat cars of which were handled by electric locomotives. Steel forms (see front page engraving) were used in constructing the walls of the locks

Belgian Taxicabs Must be Mud-proof.—Following the campaign of several of the automobile clubs of France and Belgium against the carclessness of drivers who bespatter pedestrians with mud and slush on rainy days, the city authorities of Anvers have issued an order compelling each taxical to be fitted with a mudshield, protecting the passer-by from mud thrown aside by the wheels The style and shape of the protector is not definitely stated, it being left to the individual taste of the owner of the cab. All that the city fathers ask is that it be effective elastically supported and of

1 789 201



Slide on west bank of the cut, Culebra, September 27th, 1912, looking south toward Gold Hill. This alide occurred about August 25th, 1912, and involves about one and a quarter million cubic yards of moving material. It is composed wholly of clay and occurs where a natural pocket of this material existed.

THE Central Division, of which the writer has been in charge since April, 1907, extends from Gatun due to Tedro Miguel locks, a distance of 317 miles, and embraces the entire summit level of the cumi, the water surface of which is 85 feet above sea level.

Nor attinuistrative parasses, the control Division was divided that two gents, known as the Children section—the inter being generally known as the Children section—the inter being generally known as the Children ent. This section extends from the Charres Blaver at Gamban to the Petro Mircel locks, to total distance measured along the axis of the canal of 8.8 miles, and comprises the natural summit of the water shed while separates the Pacific Blope from the Carlibeau Slope, and culminates in Gold Hill on the cost bank of the canal and contractor's Hill on the west bank. As a consequence, this comparatively short section embraces nearly one half of the foral excavation required for the cutter water-way between the Pacific Coven and the Carlibeaun Sea Actual excavation on this section was commenced by the French in January, 1882. The plan under which the gravater part of their work was carried out was for a sea level canni, T-2.16 feet in width at the bottom and 27.9 feet in depth. Owing to financial and physical difficulties, this project was modified in 1887 to a lock canal with ten backs and with a summit level 100.7 feet above sea level, and, with the exception of the period between May, 1880 and October, 1884, work was carried on cartinuously in the Culiebra et al, first by the

'Old French Company" until it failed in 1889, and later

by the "New French Company," with greatly diminished forces, until the United States assumed control in May, 1904

From the commencement of operations by the French until the canal was acquired by the United States, a total of 24,688,526 cubbe vards of material was eventured within the limits of the Cubera cut, of which 20, 440,720 cubbe vards from a part of the present approved project.

This project in the cut is for a canal with a minimum width of 300 feet on the bottom, a infinium depth of 45 feet and a width on the water surface of 300 feet. To secure these dimensions in the Cutebra cut, it is now estimated that it will be necessary to exeruste in all about 1150,000,000 cubel.

yards of material, including the useful French excavation, of which about three quarters is classified as rock

When the United States required control of the canal in 1984, the eurite force of laborers who had been working under the French Company, about six or seven hundred in number, were transferred to the seven hundred in number, were transferred to the Valides States' pay-robb, thus preventing any actual original force was increased from time to time until it attained its maximum in March, 1011, during which mouth the average daily working force in the Culebra cut, and on the dumps connected with it, was about 1900 Americans and 7,300 European and West Indian laborers.

The engineering problems connected with the work are handled by the engineering forces, under a resident engineer. In addition, there is a superintendent of transportation, who handless all transportation matters in the Central Division, and a superintendent of the water and all service, who sees that all shovels, drills, pumps, etc., are connected with water and air mains. That these positions are no subcurrens may be inferred from the fact that in the one case over 1,000 loaded and enpity trains have been handled in the Central Division in a nine-hour day, and in the other, an average of two miles of water and air pipe is laid and two miles taken up, for every working day in the year.

As most of the material to be excavated consists of



View showing point of deepest excavation in Culebra cut, September 39th, 1912. Gold Hill on the right, where highest point of excavation will be 494 feet above the bottom. Contrasper Hill on the left, where highest point of excavation will be 364 feet above the bottom. The water sizaiding in the lowest level is 6 feet above the bottom.

rock varying from very soft rock, which readily disintegrates on exposure to the atmosphere, to very dense rock of great hardness, it is necessary before this material can be executed, that it be drilled and blasted. Two kinds of drills are used in this work triped drills and well drills, and both obtain their power from a 10-inch compressed air main on the west bank of the cut, running parallel with the same. This main is supplied by three batteries of air compressors located at equal distances along the ten miles of main. All occaration in the cut is done with steam shovels with 3-yard and 5-yard dippers, the latter being used aimset entirely. The order of operation is as follows: Drill holes are placed normally about 14 feet apart and staggered. The order of operation as 27 feet, being three feet deeper than the depth to which the shovel exercation is to extend. When these holes have been completed, they are loaded with 45 per cent obesa are connected "in parallel" and fired by ments of a current from the electric lighting plant. The shovel then follows at a suitable distance and loads the material onto steel cars, which are dumped by hand, or at the dumps by menns of unloaders, and plows weighing from 14 to 16 tons.

The maximum number of drills in use at any time in the Culebra cut was 377, of which 221 were tripod drills and 156 were well drills. With these drills, an

aggregate of over 100 miles of holes have been drilled in a single month. In blasting operations, a pound of dynamite is now used to about every 24, cubic yards of material biasted, and the quantity of dynamite used per annum in the Culebra cut for soveral years just has averaged about 6,000,000 jounds. The greatest number of shorels in use at one time in the cut was 43, and the greatest monthly exervation in any single month was obtained in March, 1011, when 1788. The cut of the control of the c

To handle this amount of material required the services of 115 locumotives and 2,000 cars, siving about 160 loaded training per day to the dumps.

The same said that is a se

A control of the cont

id Mill, where the seems encouration in all Gold Mill, where the both of most of the seems to be seen to be specified as gold works above the both specific. All Contractor's Mill, a cut 804 feet with a spike in the face of the root he will be specific to the wint of the put in opposite the town of manie orders in the artism of alides on both a long width is the artism of alides on both a long width is stow. About

A the top wince same of the work, the carrier stages of the work in the use of the were unfortunately not under which were under the first steps inite were undertunately not make were undertunately not mobile to the first steps year to require a strict import the handling of dynamite and tending and firing of holes. In precaution, it was precaution, it was trapossible to avoid a consider number of miss-fires, and a was made, with the assistance ne electrical and mechanical ento locate definitely the cause of these

As a result of a long series of exsively shown that by far the persuasses, at was conclusively shown that by far the speaker sumed, of miss-free were due to the fact that the holes had been wired "in series." When the tuess were connected "in persies" and fixed by means of the profilarly electric light current, not % single failure of a fuse was holed in a test comprising several hundred fuses.

The results of this investigation were so convincing that all holes are now wired "in parallel" and miss-fires have been almost wholly eliminated, although it is scarcely necessary to state that accidents from indielessness, from flying stones, or from other causes, will always occur in the extensive use of dyna-

die, no matter what pr cautions may be adopted. It is, however, gratifying to state that although during the past three and one quarter years, in work under the writer's cha over 29,900,000 pounds writer's charge ounds of used in dynamite were used in blasting, but eight men have been killed, three of whom failed to go to a safe distance and were killed by flying stones, and two by miscounting the number of shots which had gone off in a "dobe" group, and approaching the group before the last shot had exploded.

Then, too, the character of the material to be blasted is of such a nature that slides and slips are of con stant occurrence, rer ing the use of explosives more hazardous than in or-dinary localities. In addiof excavation has been neuced in the Culebra cut, greas have been unred where, owing to presence of from pyowing to the pre tites in finely divided form, the material on ex-mosure to air generates, by exidation, a sufficient degree of heat to fire dyna-mate when placed in the drill holes, and on two ocenflicten sions dynamite has been so fired, but fortunately without loss of life. As the heated layers may lie at any distance below the seriace of the ground, and are notally wither its in thickness, it is in sible from enterpid to vation to detect the off holis by misportion. cases vibere danger on betting is appear in diamete

ped into the hole and allowed to stay there about On being taken out and passed rapidly through the hand, it can readily and accurately be whether or not there is a heated layer of material in the hole, and if so, where it is located. On one occasion, a mass of heated material was encountered, which it was necessary to blast and remove with as little delay as practicable, and this was safely done by playing a stream of water from a hose into the boles during the entire process of loading and until the holes were fired.

The total amount of material excavated from the Culebra cut to date is as follows: By the French,

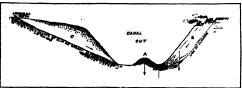


Diagram showing the action of slides in the Culebra cut. The mass C is moving into the cut by sliding the mass B breaks on a line of cleavage and crushes the underlying material, forcing it up at A as shown. Note steam shovels taking off top weight from B.

prior to May, 1904, 20,419,720 cubic yards. By the United States, May, 1904, to October 1st, 1912, 85,370,-236 cubic yards. Amount reunining to be excavated, October 1st, 1912, 9,250,000 cubic yards.

Parallel with the Culebra cut and on each side of it diversion ditches or canals were constructed in order to keep the waters from the drainage areas on the two sides of the cut from flowing into the latter and interfering seriously with or preventing excavation during the rainy season. The diversion ditch on the west side of the canal is known as the Canacho diversion and is about 5½ miles in length, extending from Culebra to the Chagres River. This diversion has a capacity, at its mouth, of 3,000 cubic feet per second and was constructed by the French. On the east side of the cut, between Gold Hill and the Chagres River, for a distance of 51/2 miles, extends the Obispo diversion, which drains an area of nearly 10 square miles, having an average amuni rainfall of about 83 inches, most of which occurs in eight months of the year Its construc-tion has cost up to date about \$1,250,000—a large sum. yet without its protection, the canal could not have been completed. This diversion has been constructed since the United States assumed control. The third diversion, known as the Rio Grande diversion, extends from Rio Grande to Pedro Miguel, a distance of about

three miles, and was constructed by the French. The large and annoying Cucaracha slide on the east side of the canal, between Gold Hill and Pedro Miguel, prevented the construction of a diversion along that por-tion of the Culebra cut.

The Problem of the Slides.

During the early stages of the work by the United States, there was but little movement of material into the canal from outside of the prism, and when such movement began, it was due almost entirely to alle caused by the slipping of the top layer of clay or earth upon a smooth sloping surface of some harder material, the layer of slipping clay in

such cases varying in thickness from 10 to 40 feet. The largest slide of this character is the Cucaracha ide on the cast bank of the canal, just south of Gold Hill, which embraces a total area of over forty-seven acres. This slide extends up the bank for a distance of over 1,900 feet from the axis of the canal, and originally had a slope of about one vertical to seven horizontal. It first began to give serious trouble in the fall of 1907, and moved completely across the canal, the toe of the slide advancing for the first ten days at a uniform rate of about 14 feet in twentyfour hours. All tracks in its path were covered or destroyed by its resistless motion, and the moving material actually rose up

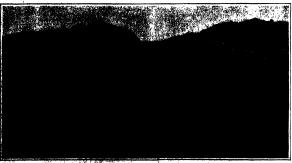
on the west bank to a height of about 30 feet. Its movement was singularly like that of a glacier. It was, in fact, a tropical glacier-of mud instead of ice—and stakes aligned on its moving surface and checked every 24 hours by triangulation, showed a movement in every respect similar to stakes on moving glaciers in Alaska upon which the writer had made observations in 1896.

Up to July 1st, 1912, nearly 3,000,000 cubic vards had been removed om this slide, and it was estimated that about 230,-000 cubic yards yet remained to be removed.

As the depth of the cut increased and the lateral support formerly afforded by the excavated material was removed, the great pressure of the superin-cumbent banks caused the crushing and squeezing out of under-lying layers of soft material, with a breaking, shearing and set-tling of the high banks and a corresponding ele-vation or "humping" of the bottom. (Nee diagram showing action of sildes.) For the past two or three years, slides or breaks of this character have greatly exceeded those of the type represented by the Cucaracha slide. The largest slide of the type just described is on the west bank of the canal at Cule bra, and covers an area of 75 acres Up to October 1st, 1912, over 7,500,000 cubic yards of material been removed this slide and fully 2,000,-000 cubic yards remained still to be removed. The



e in reck bank, side of cut morth of Empire, which occurred August 20th, 1912. About 400,000 eks slipped into the cut, destroying tracks, wrecking cars, and permitting the of the Ohiana Diversion to flow into the cut.



hin at Cilebra on the though over heat of sanat, north of Culebra. About 1,000,000 cubic yards anterfal in mythen moving bestund the cut at the rate of three feet per day on a bettem slope of mot one vertical to move, businessed. Tenn, 1912.

only remedy for slides of the first class has been to dig and haul away all of the material involv slide With slides or breaks of the second class, a like course is pursued for banks already broken; but with slides of the latter class, preventive measures as well are taken. These preventive measures consist in flattening the slope of the bank where breaks might be expected by excavating and removing the upper por-tion of the banks by steam shovels, thus decreasing the pressure which might otherwise crush underlying layers of softer material and cause the bottom to be This lightening of the superincumbent weight of the adjacent banks in the deeper portions of the cut by flattening the slope, has given results sufficiently en-couraging to warrant the continuance of this work until excavation has been completed and the full depth and width have-been obtained.

With a few exceptions, the so-called slides during the past year were in reality breaks in the bank, resultthe past year were in reathy breaks in the counts, resulting from the crushing of an underlying layer due to the great pressure of the high banks, the underlying layer being displaced interally, and causing a heaving up of the bottom, amounting in one instance to as much as 30 feet

On one occasion the writer was standing on a portion of the bottom of the cut, which rose six feet in about five minutes, and moved so smoothly and with so little far as to make the movement scarcely appreciable, it being his impression at first that the steam shovel which he was observing was sinking and not that he was rising.

was rising.

Innumerable plans for treating the slides have been suggested by interested and particular citizens throughout the country, but not one of them has proven practicable. The only successful method of treating the slides or breaks, once the material is in motion, is clouds of dust. One of these stides was moving bu a etopias of the or of the water was more or supervised to all facts south, and its rate of adoption was about 2% the per day for neveral months. A places about 2% the per day for neveral months. A places above majore made 150 cuts across the too of this willing with the position of the loading track unchanged.

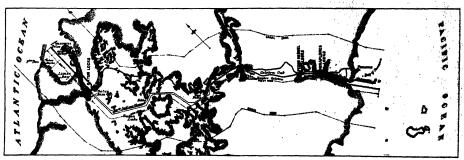
loading track unchanged.

From the commencement of operations up to Octabe
Lat, 1912, there had been speakered and removed, give
18,000,000 cubic yards of imaterial from sildes, signing
gating an area of about 200 acres, and there provided main yet to be excavated on account of slides at least three or four million cultic yards more.

As the result of several years experience, slides and breaks are now handled with less inconvenience and interruption to other work than was the case in the earlier stages of operations. Yet, notwithstanding increased efficiency in handling them, they cause conincreased successor in anatomy treat, they cause con-titual annoyance and interruption to work, and de-crease the output and complicate the engineering pro-lems; and while they present no hourseomatable ob-stacles to the completion of the work in the Oulebra cut. yet they are ever-present sources of annoyance, hind-rance and expense. Their effects are especially feet in the destruction, displacement or covering up of track, requiring large track gauge to be kept continually at work in their vicinity.

A conservative estimate indicates that within the S.5 miles of the Culebra indicates that wants the S.5 miles of the Culebra cut, fully 200 miles of track have been destroyed, covered up or have had to be built, solely on account of slides; and in one locality for nearly two years tracks have had to be maintained on material moving at a rate varying from one or two inches to several feet per day, necessitating the constant presence of a track gang in order to permit the uninterrupted passage of trains. It will be seen from what precedes that when the

resident Bagtanesting West, of A working ideas of size and quantity to it a point at which the last of land becomes alongstor indefinition. The into the milition, the mind, unhan-Agence—becomes accessed their minds impress in the san sheed by some more or less computer study of manufactures and their minds of the san sheed by some more or less computer study of manufacturement, this is to form as a displactic computer or delicities the san sheet of the san sheet when the great principle of Skypic (one of the "weet working" of the angles World) has been taken as the stingle and san sheet of the san sheet working of the angles World) has been taken as the stingle and san sheet of the san sheet working of the angles World) has been taken as the stingle and san sheet of the san sheet of the san sheet working the san sheet of the san sheet when the san sheet of the san sheet of the san sheet when the san sheet of the san sheet when the san sheet of the san sheet of the san sheet when the san sheet of the san sheet when the san sheet san shee



to dig it out and haul it away until the slide con to rest upon reaching the angle of repose for the par-ticular material then in motion. This angle of repose varies much in different localities, depending upon the character of the material composing the slide, the angle of inclination of the strata and the angles of the numerous dikes, faults, seams, etc. At the Cu-caracha slide, which has been practically at rest now for about a year and a half, the angle of repose correfor mount a year into a nair, the angree or repose corresponds to a slope a little steeper than one vertical to five horizontal, while on the west bank of the cut at the town of Culebra, the material is still moving elightly on a slope of about one vertical to five horizontal.

In one or two slides which have developed in the cut. the surface on which the material was sliding, had a slope of one vertical to ten horizontal, and in the case of another slide on the west bank of the canal, north of the village of Culebra, the moving material, which consisted of stratified rock, was moving on masse, at the rate of three feet in 24 hours, on a lignite layer the rate of three feet in 24 hours, on a lightle layer about six inches thick, which had a slope of about one vertical to seven horizontal and was underlaid by lay-ers of assilmentary rock, which did not move. A rather remarkable thing about this last slide was that, like two or three other slides, it developed in the dry seasen and moved at a faster rate during the four months when there was no rain than it has done since the rains have come.

The writer is aware that there is a very general impression that alldes are due solely to saturation by rainfall, or underground water, of the material which is in fall, or underground water, of the material which is in motion, and while this is to a great extent porrect for the sildes like the one described at Cucaracha, yet there have been three large sildes, involving in all may 2,000,000 cubic parels of material, which derel-eyed during the dry season sing were composed wholly of material so dry that when legisled on the trains, the cars were almost hidden during the windy

The state of

Culebra cut shall have been completed, not less than 22 per cent of all material excavated by the United States will have been removed on account of sides, and that they will have added twenty-one or twentytwo million cubic yards to the amount of material be excavated.

On the other hand, while their existence has in-ceased the difficulties of the work and has added very considerably to the amount of excavation, and co considerably to the amount or excavation, and considerable quently to the cost, yet flag have so far presented no obstacles which cannot be everyone without delaying the predicted date for the opening of the canal; nor will the additional material excavated on account of sildes require any further appropriation in excess of the estimate submitted by the chairman and chief

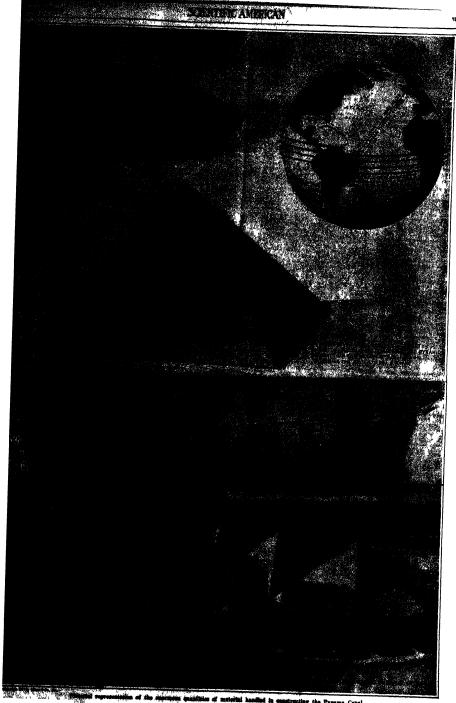
the estimate spantited by the enairman and chief engineer on September 1st, 1908.

In this estimate, the "Division Cost" of all dry excavation remaining to be done in the Central Division after fleptember 1st, 1908, was given as 78 cents per cubic pard, whereas the total cost of all excitaper cubic yass, whereas the total cost or an excess-tion in the Central Division from September 1st, 1908, to September 1, 1912, was but 95.5134. The difference between the unit price-september of in the estimate and that at which the exception was notably done between

ouwent the dust proce-squanged in the estimate and that at which the exceptation was actually done between September 1st, 1906, and September 1st, 1912, amounts September 1st, 1906, and September 1st, 1912, amounts of a total of Services and September 1st, 1912, amounts question, having bean \$17,006,890 tuble yards—about three fourths being root, It must not be undergrood, Sewerer, that this total over seveness multion delices will be a dear asting, as fully seventees to admission, stilled collect price and addition to the estimate of subscribes 1st, 1908, which have been added to the admission of the beautiful to the collection of the subscribes of the collection of th

excuration taken out of the completed canal will reach the great total of 212,297,000 yards, the average citizen understands, of course, that this represents an engr-mons mass of material. But when he is told that if the excurated earth and rook were dumped along the line of Brodelway, New York, it would prove emificient to form no less than situ-three great pyramids, reach-ing for a distance of nine mines from the factory to Harlem, there is little danger of his falling to appreciate the migrating of the task of excuration at Prinamia. Everybody knows that much trouble has been given along the line of the cental by either of great magnitudes. When we read that the total amount of write sentences excavation taken out of the completed canal will re

When we read that the total amount of extra material additional to the original estimate of ecovation, which must be painfully showed to the care and haused away out of the Customer of ecovation, which could be completed what this ments. But when we are belief that the ments are the could that this insatella, it will time to have many the could that this insatella, it will time to he has many would naise a present of which the thing would naise a present of which the could then the present the could be completed what this ments. But when we not be completed what the present of the ment of the could be completed when the could be completed to the could be completed when the could be completed to the could be could be



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# The Sanitation of the Canal Zone

Teaching the Tropics How to Live

By Dr A J Orenstein, of the Department of Sanitation, Panama Canal



Spraying with all to kill the

I N 1995 a young physician received an appointment in the medical service of the Canal Zone He told the news to a professor in one of the leading colleges of the United States, a medical man of note a man who has served with great credit and ability in a difficult post as head of the Health Department of one of our joint as need of the treath oppartment of one of our largest cities. This professor glanced at the letter of appointment and asked. Are you going to accept the appointment? Yes I am going next Monday. You are a fool, are you so tired of life that you want to And this gentleman a remarks were ty; ical of what many well informed men would have said and with good reason at that time. Let us giance at the sanitary history of Panama Isthmus of Pausma was regarded as one of the worst

pingue spots of the world. The Spanish occupation in the sixteenth seventeenth eighteenth centuries was paid for with a feat ful toll to death The The sturdy pioneer railroad builder Aspinwall carried forward to a successful conclusion the construc-tion of the Panama Rail road a railroad forty eight miles long at a cost of life impossible to verify but to which the popular if fallacious legend gives a clue A life for each tie

clue A life for each tie of the forty-eight miles In January, 1881 with 190m; and circumstance with speech making and champagne with all the coremittes no dear to the Gallic heart the great Freuch augitner Ferdinand de Lesseps fresh from his triumph in Suez inaururated the work of inaugurated the work of building the Panama Canal De Lesseps little daughter turned the first spadeful of earth in the I anama (anal prism A)-m at simultaneously with this first excession an ther and grimmer kind of excavation commenced— the digging f graves for the thousands who laid down their lives because the great engineer who fought so successfully the shifting treacherous sand: of Suez and who could have no doubt, conquered the many physical obsta cles in Panama did not ognize his most power ful antagonist in the hum ble little mosquite And so with the very first day of work on the canal the harvest of death and dis case Just h w heavy it has been can only be surmised for the m reality and morbidity statistics of the French were very incomplete

Says Froude In all the world, there is not, perhaps, now concentrated in any strage spot, so much swindling and villatiny so much foul disease such a dung heap of moral and physical abomization as in the scene of this far famed undertaking of the nineteenth sen tury And to this veritable Hades of disease and death France sent her noblest and bravest sons who with Death grinning over their shoulders did work ability and above all their courage. It took nerve

onument to their engineering skill their me to Panama then. It took an incredible amount to come to Panama then. It took an incredible amount of nerve to stay Every Frenchman who came to Panama knew that he was going to have yellow fever and that every second man taken with it would die The family of a French chief eagineer consisted of

five, four died of yellow fever. Of the five men the family of the superintendent of the railroad, three died of yellow favor Of twenty five Sisters of Charity who came to Ancon Hospital, twenty died of yel ity who came to Ancon Rospitzi, twenty used or yes low fever And so, when we speak of the squander-ing of monity by the French let us not forget that the "men on the job squandered but one thing-their lives. France failed to build the causal but she failed ecause her chief enemy was unknown to her and in her very failure France presented to the world an example of personal heroism and of engineering skill that she may point to with great pride.

When the United States Government undertook to

\*Canal Zone must be made habitable if the canal were

habitable if the canal were to be built. Accordingly measures were undertaken to rid of yellow faver the two terminal cities—Colon on the Atlantic and Tana ma on the Pacific. Simul tanoously a maritime tablished to prevent the entry into the Caual Zone of communicable diseases. of communicable diseases. The theory of the rôle of the mosquito in the transmission of yellow fever and of yellow tever to been firmly estab-sed by the work in ba. The campaign dust yellow fever was, had been Cuba therefore, inaugurated along the following lines (1) Isolation of yellow fever patients during the infectious period of the disease in such a manuer as to prevent their being r patients during moving all yellow fever patients to a screened room in the hospital (2) Fundantion of the h here yellow fever cases were found, and the house adjacent to these. This for the purpose of destroy for the purpose of destroy ing the yellow ferst in-fected monuntoes that might remain which the houses for the mosquito transmitting yellow fever, the Stegomyia (or Addes) onlopus, does not fly far, but rather remains near the place where it bred out and had its blood meal. Protection of dwell fugs against mosquit. . 67 recessing with wire gauge.

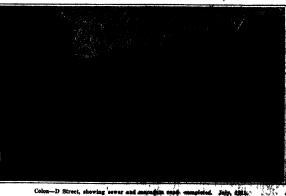
(4) Destruction of all places favorable for the

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S. J. L. Charles and Manager a



Colon-D Street, from Eleventh Street, Isoking north, December, 1998.



\* THE SANITATION OF THE ISTRIBUS

the people ned with e undertaken s' the collection sould be disconsectored. From having been

the second of th 27; in September, 6; in October, 8; in No-rember, 2; December (in Coion), 1. During 1806 there was only one case of yellow fever on the lathams, in Colon. Since then not a single case of railow fever occurred on the Institute, although a continuous indux of non-immunes is taking place.

With yellow fever under control, attention ways, yshow zere under control, attention could be directed to the second enemy of the white man in the tropics—mainria, this dissess is transmitted by certain numbers of the monguitos gream Anophelius. These jumps quifose differ greatly from the Stagonnyla caliopse in their breeding habits. While the Richardwise Group bread to water containers. convis calopus breed in water containers e to human habitations and do not fly very far, the Anopheline breed in streams, marshes water holes, etc., and are capable of travel-

like a week or so thereafter. (2) Protecting dwelling with coppe wire gause against the ingress of mos quitoes. All the houses occupied by Americans, and most of the others are screened. (3) Catching and killing mosquitoes within the dwellings. This is done by negro "mosquito-catchers," and is of great value in preventing malaria where other prophylactic measures cannot be imagurated. (4) Destroying the breeding places of Anophelius by filling, draining, and training places of Anophenius by minng, dvaming, and training the banks of streams. (5) Destroying the Anopheline in the larval and pupel stages by olling the water in which they are found, or applying a special larva poison to this water. (6) Clearing the rank vegetation in the immediate vicinity of dwellings and settlements, so as to destroy the shelter for such mosquitoes as may find their way to the vicinity of the houses; to hasten evaporation and the drying of small water collections and marshy places; to expose to view small

tion, have undoubtedly contributed greatly to the maintenance of good health. The history of pneumonia among the negroes illustrates this point. In 1996, be-fore provision had been made to feed the laborers, when housing had not been brought up to the present standard, a number of cases of pneumonia oc-curred among the negro inborers. The mortality from pneumonia was 413 in 1906 and 328 in 1907. A board ppointed to study this disease recommended that the laborers be fed by the Government and that certain improvements in their housing be made When these recommendations were carried into effect the number of cases of pneumonia immediately diminished. In 1908 there were but 93 deaths; in 1909, 70; in 1910, 73: in 1911, 94,

To carry out the preventive measures against malaria and yellow fever, the two principal enemies of the Caucasian in the tropics, as well as all the other



Toro Point, showing labor quarters with self-closing garbage cans. July, 1911.

ing considerable distances; probably as far as a mile and a half.

The campaign against malaria was innugurated on the following plan: (1) Treatment with adequate does of quinine (about 30 grains a day for adults) of all cases of malaria. First, because this treatment is retire; and, second, besture, makes to treated, and, to of malaria countitutes a force from which malaria cods. To malarial restore there are many persons int is aften applien of an expense indiari most designation or alight force. These are the be-two designation from the standards of the neu-tral for the best of these individuals that making country persons have retired the form in \$1,50 them in a district description in the form in \$1,50 them in a district description, it devalua-ted the manipulate should be a supported in the second breeding places and to remove the temptation to throw into the vegetation.

breeding spaces and, or remove the completions of anowater contributes into the vegetation.

These measures, conscientiously and painstakingly carried on, rescined in reducing the number of maintain cases treased in the hospitals from 0.85 per cent of the working frees per month in 1908 to 1.55 per cent of the working frees per month in 1911, and the death from measures assume employees from 283 to 1909 to 47 in 1511. In 1886 a good deal of preventive work had attend the strengthent What maintain would have forme to the working force, had conditions remained are they week in 2804, it indicated by the fact that maintain 1881 It is found in the strengthent of the measurest and the found that the found in 1886 and 1886 at 1990 and of the fact that maintain 1881 It is found to be a supplementation of the strength of the found that the strength of the measurest having an immediate relativity to the proposed to the measurest having an immediate relativity to the measurest having the them to be an interest.

sanitary work and treatment of the sick in the various hospitals, camps and in the homes, a force of about 1,400 is employed, of which about 750 are employed in the two terminal hospitals of Ancon and Colon, which cared for about 30,000 patients in 1911. The total appropriations for the whole Department of Sanitation for the eight years of its existence, has been about \$12,-900,000. Of this, however, only about one fourth, or about \$380,000 a year, has been expended for sanitation, that is to say, for the prevention of disease. This \$380,000 pays for the sanitation of about 100 square miles of territory with a population of about 90,000 or about one cent a day per person

Figures make dry reading, but indulge me in just one more statistical exposition. The malaria sick rate for 1906, if continued into 1911, would give on the basis of the number of employees in 1911, about 40,000 cases of malaria sick in the hospitals for the year, or a loss in labor of about 200,000 days of work. The total number of employees sick in hospitals with malaria in 1911 was 8,946-or a loss of 44,730 days of work. A gain of about 155,000 days was, therefore, m

Placing the loss to the Government for each day's labor. atment, at the rather low figure of \$3 per man, the gain in this one item of saving more than off-set the cost of sanitation proper These figures do not include the malaria cases treated in the dispensaries es. Among this class of patients the gain has undoubtedly been proportionate to the gain in hospital cases, and in addition it must not be forgotten that malaria is a disease that undermines a man's health sly and lowers his working efficiency to an extent not approached by any disease with the possible exception of hook-worm. The less malaria, the fewer

ient workers in an organization r experience of the Panama Canal has demonstrated that proper sanitation, together with what may be called by the modern term of "social welfare work," such as providing proper housing, feeding, and amuse-ments, can make possible residence, even prolonged

(Concluded on page 405.)



Pacific entrance. A typical concrete

of shortening ocean routes, first of all to enable the commerce between the Atlantic and Pacific to be handled more economically, and second, to add to the military power and prestige of the United States.

The economy due to the shortening of ocean rout measured by the saving in time vessels take to carry freight and passengers from one port to another. shorter ocean route is ordinarily more economical than the longer one, although it, may happen that the circultous route between the vessel's port of departure and port of destination may be taken, because of great-

er opportunities for trading on the way, and because of differences in fuel expenses by the alternative routes. To measure the advantages of the Panama Canal to the trade of the United States and other countries, it is necessary, both to consider the effect of the canal

### The Panama Canal and the Commerce of the United States

By Emory R. Johnson, Special Commissioner on Panama Traffic and Tolls

Table 1.—Distances and time bayed via the panama usual as compared with \$5 cellian between the atlantic-oulf poets of the united states and time was ambused. THE Panama Canal is being constructed to facili-tate the commerce of the United States and of other countries, and to strengthen the efficiency and striking power of the American Navy. The great investment of capital has been made for the purpose

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Callao Iquique Valparaiso Coronel	Miles. 6.250 5,189 3,747 3,296	11.1	35.2 20.0 18.1 13.2	ai 9 17 3 12 3 19 9	123	15.7 19.5 9.1	蓮	## .0 ## .0 ## .4	29.7 98.0 19.2 17.4	10.0 10.0	11.1		

from Panama and 2,005 miles from the Straits of Magellan, while Valparatio, the principal port of the agricultural portion of Chile, is 1,482 miles from Panama and 2,016 miles from the Straits of Magellan. The saving in distance and time between the Atlantic Gulf norts of the United States and the west coast of South America is so great that the canal will be by all the commerce, even though the price of fuel by the canal and the Straits of Magellan routes, were the same. As a matter of fact, however, fuel expenses by way of the Straits of Magellan will be seek heavier and the amount #f space which vessels will have to devote to the transportation of fuel, instead of cargo,

will be much larger.

upon the length of ocean routes and to take account of relative fuel expenses by the canal and other routes. The trade between the two seaboards of the United will derive maximum benefit from the canal. The distance from New York to San Francisco by way of the Straits of Magelian is 13,135 nautical miles, by way of Panama 5,232 miles, the canal route being 7,873 miles shorter. Between New Orleans and San see, the saving in distance is still greaternautical miles. The shortest ocean route now used for trade between the two seaboards is the one by way of the Isthmus of Tehuantepec, across which freight is the strimms of remissibles, across which freight is transferred from able to she by the Mexican National Railway. The distance from New York to San Fran-cisco via Tehuantepee is 1,016 nauticul miles, and from New Orleans to San Francisco, 1,373 miles less than by way of Panama. These differences in distance, however, will not enable the Tehuantepec route

to compete with the Panama Canal.

The freight rates of the American-Hawaiian Steam ship Company between our two seaboards are said to average about \$10.50 per ton and one third of this through rate is paid to the Mexican National Railway for the transfer of cargo from ship to ship. This churke is doubtless profitable to the Mexican National Railway, but it is probable that the cost of getting cargo from ocean to ocean at Tehnanters brought below \$2.50 per weight ton, and it is probable that even with reasonable tolls at Panama the cost of taking traffic from New York to San Francisco by way of Tehauntepec will be \$2 per cargo ton greater than the expense of taking the traffic by way of a Panama Canal. The double handling of commodities at the Isthmus of Tehuantepec with the unavoidable breakage and damage incident thereto, together with the greater cost of handling traffic by that route, make certain the impossibility of successful competition of the Tehuantepec route with that via Paname

The aid given by the Panama Canal to the commerce between the Atlantic-Gulf Scaboard of the United States and the west coast of South

America will be the second most important influence of the canal upon commerce as shown in Table I. In computing the time saved, one half is allowed for the passage through the canal.

The South American ports selected are located in the northern, central and southern sections of western South America, and the reduc-tions in time given in the table are for vessels of 9, 10 and 12 knots speed—the rate at which most freight vessels are now operated— and for vessels of 14 and 16 knots speed, which represents the rate of passenger steamers over practically all routes, except those across the North Atlantic. Callao, which is the chief part of Peru, is 1.845 miles Ruins of old Panama which was burned by the

The effect of the Panama Causi meen the trade of it United States with New Zealand and Australia pro-United States with New Zealand and austrance pro-less to be of great commercial besenfit to the United States. The commerce of the eastern seaboard of the United States with Australia and New Zealand in 1810 was valued at \$62,548,000, the increase during the pre-

United States with Australia and New Zeeland in 2800 was valued at \$45,85,000,000, the increase during the grecoding decade having been 68 per cent. Australia files a very large counserors amounting to \$150 per capita; while New Zeeland's trade averages \$170 per jahaltition. Che foreign commerce amounting to \$150 per capita; while New Zeeland's trade averages \$170 per jahaltition. Che foreign commerce of New Jelesting per capitalist in the times that of the United States. The surving in disable that the times that of the United States. The surving in disable that the times that of the United States. The surving in disable that the times that of the United States. The surving in the part of the United States and the States are the Fanana Canal will be '1.500 in Yes '1.500 in the Capitalistics in disable many of the Capitalistics of the Capitalistics in the States and the Capitalistics of the Capitali my way or me cape or tooch stops. In making case and other calculations referred to in this paper, the 1912 contract prices for coal were taken. It was assumed that the price of coal at Colom Oristobal would be 35 per ton and at Balpon \$5.50 per ton. These prices are about \$1 above the cost of coal delivered at the end of child residue on the 7-bit was of Thomas or the coal of the coal o of ship's taskine on the Jathanas of Panama at the prisent time. Under present courters, the United States Government is securing 500,000 tons of coil per annuau, delivered at the end of ship's inchine at Cristobal for \$800% per ton. It was believed in matting the coal calculations above resirved to that somewhat less than 13 per ton, would amply defirely overhead expanses, depression of rus, and lighterage charges, and that the United States Government coult, without ices, sell coal, delivered in ship's bimbiguit, at Orfesball for 87 per ton. The 1912 contract prices for Weight coult and Port State, states coult and the sell ship of the country of the country of the sell of the se of ship's tackle on the Isthmus of Panama at the pres ing, are from \$6.20 to \$6.32.
For the trade between the Ati

the Gulf Semboard of the States and Oriental countries of Singapore, the Pans canals will be comp distance from New Y kong and Mentic is al the Panis

to the state facili-

the Fanama see route for the United control of the United Control

is the first of the control of the c

This fromings of shipping that might have used a Frincisc Canal. In 1809 was carefully investigated and a spillifar scale "yes made of available canal tomage for the satisfact, year 1909-10. It was found, in 1809, that a Francisc Gazal would then have been used by shipping a 1809,000 met tons of shipping. The shipping that swords have used the canal during the year 1909-19 appointed to 8,208,000 met tons. The increase during the deriven years was 60% per cent; or at the rate of the presence of the presence of the same per second of the investigation of the traffic available for this uses of the total in 1909-10.

The details summarised in the Tible IV indicate that the commerce between the two seaboards of the United States during the statistical year 1910 amounted

TABLE IV MET TONNAGE OF VESSELS THAT MIGHT BAYE ADVANTAGEOUSLY USED A PANAMA CANAL IN 196-10.

	Total	Total Clearances	Total Entrances and
	Allurances.	CAUGE MASONS.	Clearances.
Europe with: Western South America Western Central America	1,583,887	1,594,513	8,148,400
and Pacific Mexico	80,788	118,714	199,502
Pacific United States, Brit- ish Columbia, and Hawaii Pacific United States via	419,865	200,883	689,718
Sues Canal Oriental countries east of	(1)	(1)	(1) 158,000
Amgapore and Oceania	618,704	\$55,881	1,174,585
with: Western South America.			
Pacific Mexico, and Hawaii Pacific Coast of United	300,909	166,686	467,595
States (via Cape Horn) Pacific Coast of United	117,147	85,508	172,655
States and Hawali (via American-Hawalian 8.8			
Oriental countries east of	181,718	181,713	363,426
Bingapore and Oceania.	600,000	900,000	1,500,000
Pacific Coast	158,856	259.932	418,490
Eastern Canada with Alaska, Chile and Australia	18,410	22,248	35,658
Total	4.044,981	4.125.048	8,328,029

Norm.—(1) Reported by Sucr Canal Company, hence the total is not separable into entrances and clearances at American ports.

to only about 10½ per cent of the total available canal traffic. The trade of the United States with foreign countries included 38 per cent of the total canal traffic, while the commerce of Europe with the west coast of South America amounted to 38 per cent of the total.

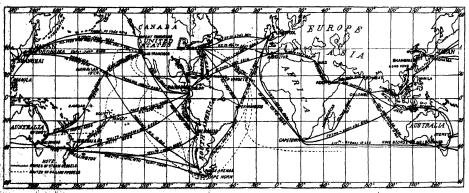
In order to estimate conservatively the probable tonnage of traffic that will use the Panama Canal during the early years of its operation, a study was made of the growth of traffic at the Sucz and of the increase of the comm of the world as a whole, and of different sections of the world. The traffic of the Sues Canal increased 70.20 per cent during the decade end-ing in 1910. The value of the trade of the United States with non-European countries advanced 67% per cent that decade. These and other percentages of commercial increase make it apparent that an increase of 60 per cent per decade in the shipping using the Panama Canal may be conservatively assumed. At the present rate of increase the commerce available for the Panama Canal during the first year or two of its operation will amount to about 10,500,000 net tons of hipping per annum. Naturally the canal will stimulate the growth of commerce, but if it be assumed that the rate of increase in the canal traffic during the first decade is only equal to the rate at which its available traffic is now growing, the net tonnage of ships using the causi by 1925, at the end of the first decade of the canal's operation, will amount to about 17,000,000 tons per annum. By the end of the second decade the tonuage may be expected to have reached 27,000,000 tons.

The canal will unquestionably largely increase the tonnage of waterborne traffic between the two seaboards of the United States. The brief table Number V classifies the estimated net tonnage of shipping that will use the canal in 1015, 1920 and 1930.

In the table the tonnage credited to the coastto-coast American shiping in 1915 was obtained by assuming that the tonnage of traffic handled by water between the two sentoards in 1910 will increase at the average rate at which the total traffic of the canal is growing. Probably it will increase more rapidly than this. It is believed that our intercoastial shipping through the canal will double during the decade endting in 1925. At that rate of growth, the coast-to-coast shipping through the canal will amount to 1,414,000 tons in 1929.



Atlantic entrance. See level section of canal, north of Gatun, looking toward Atlantic.



Map showing relation of steemship and sailing lines to the Panama Canal.



TABLE II.—DISTANCES AND TIME SAVED VIA THEPARAMA CARAL AS CONTRACTED WITH MOUTES VIA THE STRATE OF MACRILIAN RETWEEN THE ATLANTICACUS SEASOARD OF THE USERED STATE

									the state of the state of			100 100	
	From New York.						Mora Merr Delenie.						
To	Distance		Days	paved for	venets of		Distanço	Materia			eposels pf		
100	saved.	knote.	knote.	12 knota,	14 knote.	16 knots.	mvod.	lenose.	10	imon.	imote.	iceote.	
Adelaide	Miles 1,746	7.5	B.7	5.6	4.6	4,0	Miles. 3,386	14.0	28.1	10.8	9,9	8.0	Difference bearing property in Property States and Management of the Control of t
Melhourne.	2,770	12.3	11.0	9.1	77	6.7	4.203	19.8	27,3	14.8	12.2	10.7	Difference James Parison Vo. Propping Print, and Street, and
Hydney .	3.932	17.7	15.8	18.1	11 2	97	5,444	26.6	\$9,3	18.4	15 7	28.7	Difference between routes via Passan and Table and the St. The
Wellington .	2,498	11,0	9.9	8.1	6.9	6.0	8,488	18.6	24.0	11.6	9.9	8.6	Difference between rouses was Panania and Palett and the Bounds of Magellan.

TABLE III.—DISTANCES AND DAYS SAVED BY THE PARAMA OR THE SUES CANAL BETWEEN THE ATLANTIC-GULP SHAROARD OF THE UNITED STATES AND LAND.

					UM.	I EL		TOURS, W.	MD MAN	JAP CMB			<u> </u>					12	
			From I	New York.					From Ne	w Orleans	L.		F	,	,,,,	14	.,	1300	
Via	Distance		Days sa	ved for ve	eests of		Distance		Days say	red for ve	pools of				,	Benefic	L.		
	saved.	knote.	10 knota.	knote.	14 knote.	16 knots.	saved.	g iconts.	10 knots,	19 lotote.	knote.	16 leaves.						or of the	dig.
Panama Suez Panama Huez Panama Suez Panama Buez Panama Buez Panama Buez Panama Suez Panama Suez Panama Suez Panama Suez S	Miles. 8,768 1,876 18 41	10 9	15.2	12.6	5.1 	4.4	3,813 1,919 1,978	8 4 8.6	7,6			8.4 4.8 4.7		Colombio leg Pran Colombio lee Pran Colombio les Pran Colombio les Pran	Horaco el Horaco Hora Horaco Horaco Horaco Horaco Hora Horaco Horaco Hora Hora Hora Horaco Horaco Horaco Horaco Horaco Horaco Horaco Hora Hora Horaco Hora Horaco Hora Horaco Hora Hora Hora Hora Hora Hora Hora Hor	see. Hone of Yekoha ore and H oleohama s seapore. of Yokoha sapore.	rong da rong da rong bloo ron	ı mini	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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### TABLE V.—CLASSIFICATION OF ESTIMATED NET TONNAGE OF SHIPPING USING THE PANAMA CANAL IN 1915, 1920 AND 1925

`	Average per annum during 1915 and 1916.	1920	1928
Const-to-const American ship- ping. American shipping carrying	1,000,000	1,414,000	2,000,000
foreign commerce of the United States Foreign shipping carrying	720 000	910,000	1,500,000
commerce of the United States and foreign countries	× 780.000	11,020,000	18,850,000
Total	10,500,000	18,844,000	17,000,000

The foregoing details regarding the effect of the Panama Canal upon the length and time of ocean voy-ages, and the figures presented regarding the traffic of the Panama Canal, show conclusively that the new etween the Atlantic and Pacific will be of great commercial usefulness. Its effect upon the industries and trade of the United States will be large and far-

### Color Photography of the Moon

N a recent number of the Astrophysical Journal Prof. Wood discloses the possibilities of photographing celestial objects by using the visual region of the spectrum alone, the violet region alone, and the ultra-violet region alone. The photographs of the lunar surface taken by Prof. Wood by these three different methods show very marked differences of brightness. A methods show very marked differences of brightness. A patch just above the crater Arisarchus is as bright as the surrounding surface when the "risusi" region is employed, comes out rather darker on the "violet" images, "and is quite dark when photographed in the "pitra-violet" limages, "and is quite dark when photographed in the "pitra-violet" light. Some of the swarie appear darker in the violet picture and appear to be differentiated sizer set by the selective process. Proc. Wood suggests that, were it possible, to take apicture over a great range of different wifer-images, it would become possible to take up the subject of lunar petrography. A series of experiments led lint to the conclusion that the dark of experiments led him to the conclusion that the dark patch near Aristarchius is cove ed by a form of sulphur patch near Aristarchies is covered by a form of sulphur or some sulphur compends. If it were possible to ex-tend the range of photographs to where the silicates be-gin to show, by anomalies in reflecting power, one

might be able to map out the lunar surface petro graphically.

#### Schaumage's Comet

A CABLEGRAM received at Harvard Observatory
Afrom Kiel gives the following elements and epheneris of Schaumasse's Comet, computed by Schaumasses
and Fayet, of Nice, from observations on October 18th, 19th, and 20th :

(T) Oct. 25.81 G.M.T.

Time of perihelion passage Perihelion minus node

Longitude of node Inclination Perihelion distance	_		(a) (1) (q)	276° 24' 58° 58' 1.061	· . ·
* * *	Er	HEM	minte.		1 - 1
G.36.T.		R.4	,	Dec.	Light.
	h.	m.	9.	• ,	
October 26.5	10	19	88	7 51	1.00
30.5	10	20	87	12 41	
November 8.5	10	42	37	17 25	
7.5	10	54	80	- 22 02	0.87

### Correspondence

[The editors are not responsible for statements of the correspondence column. Anonymous committees are considered, but the names correspondents will be withhold when so desired.]

#### The Broken Rail Question

To the Editor of the SCIENTIFIC AMERICAN:

I am following the broken rail question. Your splendid editorial, "The Steel Rail," so far as describing the stresses to which it is subjected is concerned, is complete except the main stress, the "Punch of the Piston," plete except the main stress, the "Punch of the Piston."
and I have to disagree with the remedy you suggest,
better quality, because the heavy traffic demands a very
hard rail in order to be durable, and it is this durability
feature that renders the rail brittle. Consequently, I
am providing a remedy by taking the "punch" out of
the locomotive. Mr. C. E. Pisber's letter, "The Rail
Gessition," in which he recounts that an eagies in the Question," in which he recounts that an engine in any Middle West broke 150 rails on one trip, proves my argu-ment. What he means by the cause, "not properly bal-anced," is not understood, because the "punch" is truly ing the "punch"—the roding motion imported by the down stools of the pixton ultrastedy on opposite idea. And that two hundred broken rails were removed from a new hundred male section after one night's traffic would seem to prove that defects were not the sole cause. St. Louis, Mo. alternate, in fact, this is the principal element in cree

#### Determinism in Science

To the Editor of the SCIENTIFIC AMERICAN:

To the Editor of the Scinerusic American: In your issue of August 31st a correspondent who signs himself C. H. K. attacks my statement as to Determin-ism being the truly scientific standpoint, and advances the argument of common experience in favor of the Free-will theory. I disagree with this to the extent of main-taining that all experience, on the obstragy, points to the

100

truth of the deterministic destrine. All our systems of education, intellectual and othical, as well as all our social activities, are based on the assumption that human contact is determined by influences acting upon the will, and that it is possible to a great extent to forcess and to bring about certain lines of conducts at the cautie of certain causes. According to the Free-will theory, however, we are anery, despondent, foolish, victous, or whatev we are angry, despondent, rootism, violous, or whatever, simply because we choose to be so. I cannot think that human mature is so base. I believe that if the will were free we should all be sages or smins. Your correspondent closes his letter with a query as to

Tour correspondent closes his letter with a query as to which is the more scientific, Free-will or Determinism. Determinism is selectific, Free-will is no. Determinism in the property of the selection of the law of cause of the property of the selection of the law of cause of the property of the selection of the law of cause of the property of the selection of the law of causes — which its turn results from preceding causes, and so on back to sinficity. Free-will assumes that psychiatal phenomena transcend this law of cause and affect, and admits the unthinkable decirities of chancel.

Determinism is not a "tany man't doctrine," as I have heard it called, It sanother the pships of defeat it is trucy, but unto him who has copie to well as the property of the property o

Gyroscopic Action of Revolving Aproplane

To the Editer of the General property Assistman:

An answer to Mr. Hypologic Individuals in your less of factoring and the property in the state of the property in the propert

the plane of rotation of the motor is not ch

enough to produce a noticeable gyroscopic effect."

I saked the late Paul Psek some months ago whather he was troubled by this force, when he replied that he noticed it in the beginning, but after he had gottern used to the motor he found that it rather added stability to the aeroplane flights and that he then forg

This is evidently the experience in France, where, I am sure, not less than three fourths of all army sero-planes are fitted with revolving-cylinder motors; and

planos are fitted with revolving-oplinder motors; and we have very little of accidents from that country. Paul Peok came to his early death because he had the fatal tendency to steep display, against which risky habit he had fitten been warsad by a number of peoples to lay the littens for the specificant to the gyrescepie action of the motors as such is therefore unfair and un-

Washington, D. C.

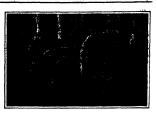
The Refractory Collar Button
To the Militim of the Sourcery Collar Suction
To the Militim of the Sourcery Collars Success
W. S. E. S., your issue of August 1981, 1982, or sixty one payeline on the back of a button-habe to easily they preside of a vollar button.

As payelines in an interpretation on which the particular in the success of the succ

The Electrification of the Panama Canal



By David B. Rushmore, Member American Institute Electrical Engineers



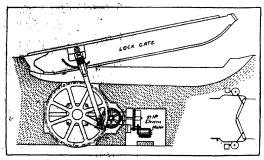
Steam-electric power station at Miraflores.

Type of motor to be need in a

THE work of digging the Phun-lms Canal has a history of the cops. As the operations passed n hite homosay to another, and n one bompany to another, and man succeeded man in charge of mork, the plans underwent con-in medification, and methods of medification, such work have d through a very great evothe lathum have been machines belonging to different decades of historical development. In the materical development. In the work of construction electricity has assertinately filled a minor part. Due to the pressure at the time the United States Government took control and the necessity for immeditro and the necessity for immediate results, it was impossible to de-vision the water power on the Chagran Biver as was planned, and to use electric power for a large part of the work. Also, civil engi-neers have not utilized electrical machinery to the extent which they will in the future, and the small self-contained steam units were applied much more quickly than could piled much more quies; y man count have been done with electricity, even though the final cost for the present methods must necessarily be higher. When we come to the operation of the Panama Canal, however, the situation is entirely Here the present management has had a free hand and electricity will be used throughout all the operation of the machines and appliances incidental to the use of the canal.

The principal application will be that of 986 motors of 84,300 total borsepower for the operation of the lock gates, fender chains, pumps, etc. Ships will be towed through the locks by powerful electric locomotives, and a large miscellaneous application of electric power will be found in the machine shops, the dry docks, coal handling wharf cranes, and it will be used for many other purposes. Electric lighting will be used wherever possible in connection with the canal and nearby towns in the sone, and the relocated Panama Railroad will possibly be electrised in the

The power will be generated in the lower will be generated in two large stations, and over one thousand motors will be used for the operation of the canal. Two steam-electric stations now exist at Gatton and Miraflores, each consisting of three 1,500 EVA, 8-phase, 25-cycle, 2,290-volt, steam turbodriven generators; two \$5 Kw., 125-volt turbo-driven excitors with the vast turno-dirven exciters withis the homessary writerboards, privary converters, sie. The power station at Highestones with above developed from a Applicationaries station at a Applicationary station at the stationary at the



Plan view of mechanism for opening and closing gates.



Completed gate-closing gear, showing 27 horse-power motor, gear, and 5-ton arm.



splilway. This hydraulic plant will nsist of three 2,500 KVA, 3-phase, -cycle, 250 revolutions per minute, 2.200-volt. waterwheel-driven, exciters with provisions for three additional units.

Protection against severe strains of short circuits will be obtained by the use of external reactances, consisting of air insulated colls mounted on concrete cores. The 50 kilowatt exciters will be mounted on the vertical shaft below the rotating field and above the waterwheel. In addition, there will be two 190 kilowatt induction motor-driven ex-citers taking power from the main 2.200-volt buses. Remote control will be used throughout and the operator will be located pear the switchboard on the second gailery, from which the entire station may

Two hundred and twenty-volt motors will be used for operating the locks, and transformers located at various sub-stations will be used to step down from the 2,200-voit power of the generating station. The transformers will be located in rooms, each of which will be practically a self-contained sub-station. The Gatun locks will have sixteen such rooms. There will be eight for Miradores, and Pedro Miguel will require twelve. Every transformer station will have duplicate transformers, of 200 KVA capaci-ty, feeders and buses to provide for a continuous service in case of emergency conditions. Under the usual conditions of operation one transformer will be connected to the locomotive track and the other to the machinery motors. Should either feeder or transformer break down a quick transfer to the re-serve unit can be made. In each room there will also be installed a single-phase lighting transformer of 25 kilowatt capacity, and there will be distributed throughout the locks approximately 7,000 lamps. Oil switches of special "foolproof" design, automatic relays, panels, etc., constitute the control equipments; the design of which has been carried out with extreme care to provide for maximum reliability and which in maximum reliability and flexibility of operation, together with the greatest safety for the operators, which latter is of unsual importance in connection with the climatic conditions of the Canal

Altogether over 1,000 individual motors will be required for the dif-ferent locks. The most powerful electric motors ever designed for nercial service known are the mill-type motors, which are used for the rough service of steel mills. It is these motors which will be used for the gates, valves, cranes, emerg-ency dams, etc., and they will all be fitted with solenoid brakes. The load curves of these show an ex-tremely intermittent service, and vary to a considerable extent with the different applications. Apparatus which has been in idles

(Concluded on made 10th)

The House Fly's Deadly Scourge ICTURED in the accompanying photograph is a house fly which him been stroyed by the parasitic fungus known as Empuse muser. This ties deadly enemy of the house fly, at destroy myriads of these paralelous in-sects, especially in the fail. The flies may often be seen in a dead or dying condition on walls, ceilings and window-panes, surrounded by a quantity of white powder, i. e., the spores of the fungus which have fallen from the insect's body. These spores are capable of infecting other files which may come in contact with them. Whether the files actually eat the spores, or merely get them at-tached to their bodies, is not apparently

#### The Bezoar and Its Imaginary Virtues

N accordance with the ar cient idea of ascribing to everything of mysterious or obscure origin, occult, often mar-velous properties, the besoar, not infrequently found in the stomachs of her-bivorous and ruminant quadrupeds, goats elopes particularly. has been and anteropes particularly, mas been credited with qualities that imparted to it a great value among credulous and semi-civilised peoples, especially in ancient times.

Having as a rule, for its nuclet indigestible substance, taken into the stomach with the food, as a measure of protection and to render it harmless, it was gradually coated with a concretion of al substance, just as the oyster, coating an intrusive particle with na matter produces the much admired and costly pearl. Sometimes the coating con-sists of superphosphate of lime and somes of phosphate of ammonia or mag-

In many instances, the hair carried into the stomach in the course of the licking ess by means of which these animals cleanse their coat, would be incorporated with the mineral deposit and felted into with the mineral deposit and rested into a mass of great solidity, the bulk being at the same time greatly increased, so that these accumulations often reached a diameter of several inches. In the stomachs of slaughtered beeves such

asses are quite common.

These, however, were not the besoars that were esteemed for their remedial or protective properties. The latter were compact concretions of mineral matter sometimes radial in structure, sometimes composed of concentric layers and of stone-like hardness. They are classed as Occidental, Oriental and German. It was in the Orient—the land of mystery that the besour enjoyed the widest estee for its supposed medicinal virtues. The sion of such a concretion was believed to insure the protection of the owner against various diseases, they were also regarded as especially efficacious as an antidote to poisons and even against the bites of the venomous reptiles with which tropical Asia abounds.

While these virtues must be regarded in the light of modern science as of course entirely imaginary, the ownership of such a protection may have proved, to some extent, an involuntary and hypnotic aid to the sufferer. As a consequence, considerable value was often attached to notably fine specimens of bezoars. In India, especially, their value increased enormously in proportion to their size and choice specimens commanded very large prices.

They were mounted, according to their dimensions, for display or for suspension from the person, special care being taken to leave the bezoar substance plainly visible. In many instances, as the accompanying illustrations, made from photographs of gold-mounted specimens pre-served in the Court Museum at Vienna demonstrate, they were even in Europe thought worthy of being inclosed in costly and artistic settings, by which, of course, ing extent.

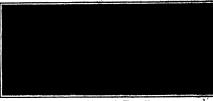
Besiders are invited to contribe evallable will be paid for prom



on the first transfer of the control of the control



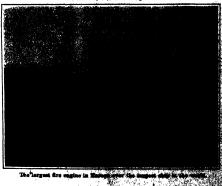
Fly destroyed by a parasitic fungua.



Gold-mounted bezoers in Vienna Museum.



A mound of 13,000,000 cartridge cases.



Skin and wool desires buy such fie at reduced rates. Hence it is desire to find another method of marking, has been proposed to use asiline co but this is even worse, since the do not merely soil the fleece, but a dye it.

Other means are not lacking, not that of tattooing the ear of the sh also, a small metaltic plate can be a ened in the ear, as is done with Are sep to prove that they have been "old Heed," I. e., inoculated with the special rum which combate their dangerous and

serum which combets their emagerous and contagious graptive mainty, ret or seah. The Syndical Chamber of Commerce and Industry advises the employment of a color composed of liceted etc. essence of pentine and Prussian blue or simil r. It recommends marking on no color. It recon ad, or name of neck

#### Thirteen Million Cartridge Cases

Thirteen millson Cartriage Cases,
At first thought one night is inclined.
At on think that the secompanying phatograph showing a mound of 13,000,000 cartridge cases was taken on some battledd in the Balkann. These are not rifecurtridges, however, but paper shells from shotgams and the pile was collected at the Hendon School of Shooting in Ringland. It is a testimony to the love of hunting for which the Retitied are noted. lrunting for which the British are noted. muting for which the British are hosel, and it shows how the Englishman will take infinite pains to make himself pro-ficient in this class of sport.

## Testing the "Imperator's" Bulkheads

THE giant transatiantic liner "Imwhich is rapidly nearing pliction at Hamburg, Germany, re-tly underwent a very rigid test in er to determine the efficiency of her bulkheads under extreme conditions. A number of the compartments were filled with water to prove the strength of steel bulkheads. The water was it gamped out by the largest des engine ope. The accompanying phose the "imperator" at her do great fire ongine being lifted.
As compared with the as to of the great liner, the dis-trustrations. The test pro-bulkheads would be equal to a runck as befoll the ill-dated." sther exteguard the

The state of the s

The similarities of Great Britain in presenting this of a sweety sie the definite regime intended to practice that the sie of the Book Canal, considered it for sign; the formulates a general reservation as the regime of the Book Canal, considered in the sign of the sign

It regains to consider briefly certain military objections which have been made to the policy of fortifica-In the first place, it has been objected that fortions were unnecessary for the canal, on the ground edies. In the first piace, it has been objected that forti-tion there were tuncionary for the canal, on the ground clast the detense would be assured by our naval forces. Wilds objective arises from a comprise misconception of the true function of the may. The relative func-cion of the land forces in defence of the canal will be the mass as in the defence of any other part of our see load. The navy can be used to advantage only when operating on the offensive; and it will be tree in operate in this manner and to go where it can do the most good, only when our vital interests are not dependent for pretection on it alone. To relegate the mary to the role of plassive defence, and to the it down to one locality, would not only be the most expensive insentiate forms of protections to the canal, but it would to one locality, would not only be the most expensive justific form of protection to the canal, but it would canceled to the enemy at once the command of the sea, and parantic him, to operate unhampered, without danger of interference by our facet, against all other portions of our coast line. It is in recognition of these prin-ciples that the Tailand States, as well as all other pow-ers, has provided fortifications and armed forces for the protection of its Important seasonst cities, dock-yards, and naval lesses. It was due to the security desirated or coefficient of the Sananeae ports that their defended condition of the Japanese ports that their fleet was free to seek out its proper objective—the Esseian fleet—without fear of interruption or recall to geard its home ports against raids by the Viadi-vostack aquadron. To secure an effective protection voscors aguatron. To secure an effective production for the cause by means of naval forces only, without at the same time unduly exposing our seacoust to naval attack, would involve an expediture for battleship by great as probably to be found prohibitive; au equal protection can be maintained by means of on and a military garrison at a very small

resultage of such cost.

Again, it has been objected that the causi is so clated with respect to the United States that it will be impracticable to secure its successful defence. That is, on the contrary, that the Panama Canal Zo The is unique in its possibility for reinforcement from the United States. Situated as it is upon two oceans, its United States. Sitested as it is upon two coesias, its opportion leads itself better to a successful defance than does any other of our, oversee possessions. Communication with Dovo Rico, Alaska, Hawaiii, Guam, or the Philippiles Islands, can be had by only one coesa. If their communication with Dovo Rico, Alaska, Hawaiii, Guam, or the Shilippiles Islands, can be had by only one coesa. If their communication of these later possessions are situated, committed any of these later possessions are situated, comany commy gain the naval supremery on the comm on which any of those latter possessions are streamed, commissionation which any of those latter possessions are streamed, commissionation which the United States will be indisrupted and the possibility of reinforcement stopped. Commissionation few tevers Phisness and the United States, not the other head, each he had by both the Atlantic and the Fessible occurs. We forge us the United States holds hid classif, it will be impressible for the enemy to indiscriptly consens, forge to the United States and the Possible occurs, and consequently the quarters of the United States and States and Commissional Same Merit May happings of the cause results be-shown a fill subline of generative it against the author of the subline of generative is an interest to a constitution of the cause of the cause of the sub-cess of the cause of

And the second s

patilishts, to the effect that the topography at the Addantic securious of the canal is such that fortifica-tions, so matter how strong, would not be sufficient to keep a heetile fleet at such distance from the mouth samal as to prevent its destroying our fleet in id the sanal as to prevent its destroying our fact in destail as, its passegue in column. As to this, I need eathy "state" that "share the objection was made the eathy states" that "share the objection was made the realth spaties, the last her referred to the General Board of the Says, and the investigation and report has shown that the "sheldhon is entirely unfounded. Their re-port states" it char that if the Atlantic terminus of the cannal he furtiled, a feet can emerge from that torminus in the face of a heatiful feet with less danger of dam-New Assessment of the see anger of dam-see from the enemy's fire than if emerging from New York city, Boston, or Hampton Roads. I quote certain pertinent portions of the report:

when the control are designed to the control and the control a

To sum up, fortifications and a military garrison will serve the same purpose on the Panama Canal Zone as is served by the fortifications and garrisons in and around our important seacoast cities. They will free the feet and permit it to fill its legitimate functions in the fleet and permit it to fill its legitimate functions in seeking out an opposing fleet of the enemy; they will prevent the hombardment of the locks and operating machinery (which are not, as has sometimes been as-serted, too far inland to be damaged by ships flee; they will enable our fleet to be transferred in asfety from one come to the other in the face of an opposing et; and they will prevent the destruction or seisure e canal by a raiding force of the enemy. They are the only means, other than those which would arise through the adoption by the United States of a naval policy similar to that of England, by which the United may mente to it atrol of the canal. mre to itself the continued possession

Bottom quary security to itself the continued possession and control of the canni.

In 'this 'discussion I have avoided criticism of the officing of instructional agreement or treaty to accomplish date spile at whath the treaty is already of instructional agreement or treaty to accomplish date spile at whath the treaty is already of instructional agreement of the purpose of argument that the treaty or bleshiftshipsis agreement when made will not be recommended in the control of the problem agreement when made will not be recommended by the control of the

less than two years after the later guarantee, the Japanese naval commander at Chemulpho violated with impunity the independence of that port and notified the dan commander of the fleet that unless he left or he would be attacked at his anchorage, and at the same time warned the commanders of the neutral vessels present in the harbor to take measures for the safety of their ships.

Shorty after this incident Japan established in effect a protectorate over Korea, which has been described by an authoritative English writer on international law as constituting "an undoubted intraction both of the treaty of Shimonoseki and of the Anglo-Japanese

Even as I write the Turkish army in front of Con-Even as I write the Turkian army in front or Con-stantinople is fighting to accomplish what none of the great powers who were parties to the treaty of Berlin and interested in the preservation of the Ottoman Empire has, as yet, lifted a finger to effect.

In 1908 Austria-Hungary annexed Bosnia and Herze-govina, notwithstanding the fact that Austria-Hun-gary was one of the seven signatory powers to the gary was one of the seven signatory powers to the treaty of Berlin in 1878, which left the sovereignty of Bosnia and Hersegorina with Turkey. This action, while supported by one and resented by other signa-tory powers, invoked nothing more from any of them than an expression of dissatisfaction. The incorporation of Eastern Roumella with Bulgaria, and the declaration of independence by the latter country in 1908, were further violations of the treaty of Berlin; violations that also were permitted to pass without effective protest by the signatory powers to that treaty. In the words of an eminent authority on international law, these acts have "demonstrated how worthless the treaty of Berlin is in restraining political action in the Balkan Pentusula."

1790 the Kingdom of Prussia guarante ce of Poland: in 1792 Prussia played the leading part in the partition of Poland. In 1807 Great Britain, without any excuse, except that she deemed it necessary to her military policy, entered the harbor of Coper hagen, belonging to a nation with which she was a peace, and ruthlessly destroyed the Daniah fleet.

These instances, selected at random, serve to indi-cate that it is not always wise or prudent to trust the care tast it is not an aways wine or prunent to trust the protection of an invaluable national possession to international agreement or treaty faith. They serve to justify the remark of Mr. W. E. Hall, perhaps the most eminent living authority on international law, to the effect that "treaties are only permanently obeyed when they represent the continued wishes of the contracting parties."

#### III. Character of the Fortifications and Defences.

Necessarily only a general description of these can be given. What has been said heretofore indicates the object of such fortifications and the purpose which they are intended to subserve. The defences to the Isthmus are divided into two general heads:

\*\*1. A seacoast arranment with submarine mines at the termini of the canal, for protection against a sea states and to secure a safe exit for our face in the face of a hostile fiect.
\*2. The construction of field works and a mobile force of troops to protect the locks and assure important utilities against an attack by land.

The seacoast fortifications will include 10-inch, 14inch, and 6-inch rifles, and 12-inch mortary. This arms. ment will be of more powerful and effective types than that installed in any other locality in the world. At the Atlantic end of the canal the armament will be located on both sides of Limon Bay. At the Pacific end the greater part of the armament will be located on several small islands, Flamenco, Perico and Naos, which lie abreast of the terminus. Submarine mines will complete the seacoast armament and will prevent actual entry into the canal and harbors by hostile

In addition to these fortifications, and the ne coast artillery and garrison to man them, the defendive plans provide for the erection of field works, and for the maintenance at all times on the Panama Canal Zone of a mobile force consisting of three regiments of infantry, at a war strength of nearly 2,000 men for regiment, a squadron of cavalry, and a battalion id artillery. These latter fortifications and the of f or new arthery. Answer nates Avanagement and mobile garrison are intended to repel any attacks that might be made by landing parties from an enemy's fleet against the locks and other important elements or accessories to the canal. As an attack of this char-acter might be coincident with or even precede an actual deciaration of war, it is necessary that a force of the strength above outlined should be maintained on the Canal Zone at all time. This mobile garrison on the Canal Zone at all time. This mobile garrison will furnish the necessary police force to protect the Sone and preserve order within its limits in time of peace. Congress has made the initial appropriations peace. Congress has made the initial appropriations for the construction of these fortifications, and they are now under construction. A portion of the mobile sarrison to also on the leibmus, and the remainder will be sent there as soon as provision is made for its being housed.

CAP—C. I Director and Experience, 187 Grand St., New York, N. Y. This 'invention for relates growning to caps and more particularly to adjustable caps, such as disclosed in the U. S. Letters Patent leaved to these inventors. The construction and strangement is such that one cap may be work by persons requiring caps of different alone.

ing cape of different sizes.

SKIRT MARKER.—MARK ANDERSEN, 207

Size St., Brooklys, N. Y. The primary object of this farention is the production of an apparel apparatus which will be of simple and comparatusly change construction and which may be used by any womans whereby the production of the prod

#### Electrical Bevices.

CIBCUITY CLOSING C. STATES, Oldiam.

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8. c. STATES, C. STATES, OLDIAM.

8. c. STATES, OLDIAM.

9. c. S

#### Of Interest to Farmers

Of Sasterces to Farmers,
CULITYATOR—R. C. DOUGAN, Drawer 7,
Millersburg, Ohio. The intention in this case
is to provide a simple device which will theroughly work up and disistregrate the soil, and
wherein means are provided for guidling or steering the cultivator as it is drawn through
the field.

the field.

IIORING MACHINE.—W. R. STURGIS, 519
Concert St., Keokuk, lowa. The object here is to provide a simple, casulty operated and ecanomical machine wherein mechanism is provided for hosing and thinning of plants in a manner closely resembling the thorough operation of hand working.

ation of hand working.

G. H. Les, 1115 Haracy Ht., Onaha, Nob.
This inventor provides means whereby the
temperature in an incusting chamber may
temperature in an incusting chamber may
temperature in an incusting chamber may
temperature in an incusting chamber and will
provides means for arresting the smoke or
tunes emanating from the ordinary baster
lamp; and provides registers for regulating
distribution of the best.

#### Of General Interest.

TILE SETTIFEE.—G. W. McGarov, Marshall, Minn. This improvement involves a device for use in setting tiles in position in wells or similar exeavation, and the principal purpose of the invention is the prevision of device which will perform the work in an efficiency of the control of the work in an efficiency of the control of the work in an efficiency of the control of the contro

pose of the invention is the provision of a close many of the invention is the provision of a close many of the provision of a close many of the provision of t

FINGER EXERCISER.—J. R. MANNER, P. O. Box 115, Jefferson, Ind. The object of the invention is to provide a simple device adapted to engage certain singers of ether hand and

RECENTLY PATENTED INVINENTIONS

These columns are open to all sates has a local function and the states while the nation are invited by speaking supposed and the states while the nation while t

Blandware and Tools.

Balance—G. Yolays and G. Q. Yolays,
New Bochele, N. X. For the purpose of dysinvection use is made of a rider rod prevised
with a resilient flager adapted to oppuse, the
boam on turning the rod with a view to impart a swinging motion to the boam on tends
the conditionass thereof. Use it also made



of a rider supporting arm held on the ridge rod and provided with a hook for supporting the rider, and a stop lug in the rear of the hook to prevent the rider from situping based on the arm. A side elevation of the ridge carrier, as applied to a balance in dermant position, in shown in the segraving.

position, in shown in the engraving.
DEVICE FOR FASTERING SHADER TO
BOLLERS—G. W. FUUVEAUN and S. H. HOOR,
CLAMPION, M. This investion provides as
alongsated fiestible fastenes with projections on
one free for engrangian the shades and the rollies,
in which a pointed terminal at the other end
in which a pointed terminal at the other end
is normally disposed and turned over, for
holding the fastenes around the roller and an
out of the shade, the fastenes being provided
and of the shade, the fastenes their provided
ing and building the end of the shade in place.
BITPORY FOR TOOLS—J. PREMEMBER. ing and holding the end of the shade in place.

RUPPORT FOR TOOLR—J. J. DILLHEATS,
852 W. 47th 8t., Chleago, III. This improvement pertains to supports for tools, the more
particular purpose being the provision of a
next, handy, and simple borrom of portable support for such tools as are usually employed by
composites, esseem fitters, plumbers, and the
originative, steam fitters, plumbers, and the

SHADE SUPPORT.—A. B. SMITH, care of S. Witsman & Co., 99 N. 26 Rt. Memphis. Tenn. The two telescopic members of the support have brackets for carrying the shade roller, except the shade of the shade o

placed.

SAPETY BAZON.—D. W. Wood, care of McNett & Shattuck, 12 Kulght Block, Rraall, Ind. In this instance the invention refers to safety rasors, and the aim is to provide a rasor which is adapted to all pertions of the face, and which will give a transversely abeat-rane of the same of the s

Beasing and Legistime.

OPENING DEFICE FOR PINACE POORS.

OPENING DEFICE FOR PROSECULAR OF THE PROSECU

#### Household Utilities,

Monachold Unitation,
COOKING APPARATOR—Linearity J.
Fal., care of Dorrillion, Broadway & Tist Be.
Now York, N. This apparatus is for use in
brollian toasting or otherwise treating articles
to brollian toasting or otherwise treating articles
or page 100 pa

Machines and Machaniani Boyle PAPER GUIDE.—Alega U. Daves, Box 210.



tons any growned from falling or cartising be-treen the leave of the supper below the gaper and carbonic enter the supper below the gaper and carbonic enter the supper below the carbon copies. The illustration gives a side view of a fragment of the frame of a typewriting machine, showing in conjunction theoretic resums for sufficient position of delivery from

the plates,

&APPIT DRAWBRIDGE ATTACHERENT.

E. F. SCHOUNTERALES, Long Branch, R. J. Bg
means of this state-threat the entraine to
mean of this state-threat the control of the control of



SAFETY DRAWBBIDGE ATTACHMENT.

AAPETT DAAWARIDOR ATTACHMENT.

a point where the manipulation of the heidge itself is controlled, such as the ongine-house on the bridge. The gates can only be opesed in the bridge. The gates can only be opesed in the possible of the poss



PIREARM.

when the barrel is rotated the extractor will engage a member on the stud, which will hold the attractor against movement when the barrel is moved longitudinally away from the breech piece, the extractor in this way removing from the learn't the shall. A side elevation of the the study of the study of the study to be feath of the study to be feath of the study to be feath of the study of the

Prime Novere and Their Association.

AUTOMATIC SPIRI ADVANCES.— G.
Consider. Richardon, Xan. 'Yes investion.

Richardon, Xan. 'Yes investion.'

Consider. Richardon, Xan. 'Yes investion.'

Consider. Richardon, Xan. 'Yes investion.'

Consider. Richardon, Yes investigation.'

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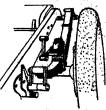
Automatic the spirit in agreement of the consideration.

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designed for this purpose. All working parts of this device are housed and the ganz case is pucked in greate and rendered noiseless packed in greate and render designed the noving parts is contact though one of the noving parts is contact though one of the noving parts is contact the parts of the noving parts in contact the parts of the noving parts in the instance of the render of the noving parts of the new par

## Besigns. DESIGN FOR A REINFORCED ESTITLE. —M. C. HOFFMANN, care of H. M. Kiddee, Scribner, Neb. This ornamental designs is of a reinforced kettle of excellent proportions and outlines of graceful curves.

DESIGN FOR A COTEMEN DISHI OR SIMI-LAE ARTICLE—7. B. SENDAR, Alterner, Germany, care of W. Greeks do., 35 Parts Germany, care of W. Greeks do., 35 Parts send dish has a handle at each end of and midway of the body of the article, and from those the body sinate toward the cover and the base. The last is fint and the cover in country of the base of the country of the rounded with a handle in the center. The design is beautiful in its simple outlines.

Norm.—Copies of any of these patents to be furnished by the Suranvarer: Assentian ten cents each. Please state the same of patentse, title of the invention, and date title paper.

Wh with to call attention to the fact that greate in a position to reacher competual services in any braich of passers or reades competual services in every braich of passers or reades work. Our staff is compased of mechanical, solutions and of competual services of competed of mechanical solutions of the competed of



from an request. This emploise our temper of regard to PATENTS, is MARKS, ROBEIGN PATENTS, etc. stigute assured through us are described it soul to the patenter in the SCIENTIFIC NO. A.V.

MUNN & COMPANY

ENTS—One such invested in a Postal Card Fing year a 225 to 260 a west proposition. For a personners communicate with American

PATENTE FUE MALE
ICALLY compost mixing machine for and forests Bertains improvement double and assured crops. Used by agreement Foreign patents for mic Writ Johnson 30 Church St. B 306 New York CONSIDER responsible offer amieting the control of article No 725,455 oracil whole on the Right granted April 14 1908 Address Address

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INQUIRY COLUMN

quiry No. 5555 Wanted the names and od-ies of concerns that only cost steel balls with his ano-distantia of an inch thick. Free operations when said without make it had bardening when said without imperior and without make and without emporative factor values.

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function in \$1500 Wanted name and a
manufacturer of a patentied device which
for maintage up my envelopes maniel
p title and insert shop with inter coins
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## By William Atherton Do Pay

THE positivity is written assured as a ray "THE positivity is writer who holds that the hand of all the world is against him was that his cleas are so ahead of the times that they may not be appreciated until he is deed and gone is still abroad in the tand. He believes that he has the facts from which to draw a conclusion that he from which to draw a conclusion that he who makes an invention that is revolution. ary is to suffer many reverses and to wait long for his reward. There are many eases of record to substantiate this belief. There is, however a question of their application to the inventor of to-day

to the inventor of to-day
There is the case of Su Henry Bessemer
for instance and his difficulty in inducing
the world to use his obvious and revolutionary methods of peoducing steel So
great was the effect of the Bessemer process BROADWAY NEW YORK upon the steel business that the production in England jumped from 50 000 tons a year to 4 000 000 t Classified Advertisements is introduction and so great was the affect of the chasper methods of refinement in the composition of the chasper methods of refinement in the composition of the chasper methods of refinement in the composition of the chasper methods of refinement in the composition of the chasper methods of refinement in the composition of the chasper methods of refinement in the composition of the chasper methods of refinement in the chasp

Bessemer went at the problem of im proving the manner of making steel de-liberately He wanted a stronger metal for the barrels of hig guns He knew nothing of the business. He began at the bottom and learned the science of it. In the end and learned the scenese of it. In the end he made a retort with provision for foreing air in from below. He rielted his iron and turned on the air. The whole immediately become a sparkling furnace that burned so hotly and so rapidly that it was impossible to reach the valve which would turn off the air. So hot was the fire that the off the air So not was the fire that the very fastenings of the retort were nearly melted The transforming process was however completed before the heat had demolished the plant So was the dis-

Yet those people with whom Bessemer contracted for the nac of his process failed utterly in getting results and shandoned it He formed a company of his own built a plant and began the production of steel This he sold at a price that the producers under the old process could not meet and still made a fabulous profit Thus he proved the value of his patents and after many years brought them into general use and from the royalties he received he waxed fabulously rich

waxed facultusly rich

( Francis Jenkins is one of the inventors of that familiar entertainer of the
ninety millions which is now to be seen in
every town and hamlet of the nation the moving picture For four years he worked upon the moving picture idea before he finally hit upon the key to the whole situannamy art upon the key to the whole situa-tion which made the productions as they are seen to-day actually possible. It all depended upon the size of a hole in a shutter and that which Jenkins made was the right size. Because of this, his machine

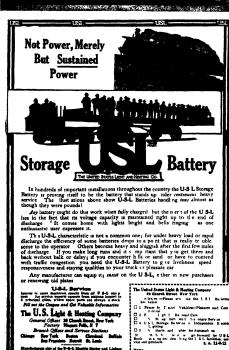
vorked
Yet this great invention was a thing Yet this great invention was a thing which led its maker immediately into inlimited worry and harassment In the
first place he attempted to popularse the
moving picture and to put it on as a show
as it is now pirot on in so many thousands of
theatras. This proved a heroulean task
The moving picture was a thing so novel
that there was nothing with which to com
pare it. The public could not be reached
by a word of mouth applanation of it. An
artherisament could not be written
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bar it. The public bound not be rescored by a word of mouth explanation of it. An advertisement could not be weithen that would carry home an appreciation of what this thing was. The people sould not un derstand, that it was anything more than a magic lantern reschine through which one pletture after another was drawn. The first moving poisure show that was over put on and saked for public patronage was at the Cotton Shaket Reposition in Atlanta, in 1905. People would not pay admission to the show; so fleasify the doors were thrown open to the public and they were saked to leave h quagree at the box clience after the show it sign quantificing that they had been addenication to that

The deviation's second di-

4. 19 10.5





There is never any question about a good Unfinished Worsted. It is right.

Rich, dignified, prosper-ous-looking, it takes the graceful lines of good tailoring and holds its appearance through long wear

It is important, however, to get a good unfinished worsted, and the best way to be certain of quality is to order

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This is one of the thoroughbred style fabrics for men who care, made by the American Woolen Company. It is carefully made, pure worsted and thoroughly dependable. Black or dark blue; London shrunk, 56 to 58 in. wide.

If you prefer a blue serge for Fall and Winter, ask your tailor or clothier to show you Oswego Serge.

tautor or cionner to mow you Owego Serge at good custom utilorit and in high-grade ready-to-wear mits at the better class of ciothers. If your dothier or timior cam-ties the control of the control of

American Woolen Company

BELLING AGENCY

of our 455 ton truck during the past six mouths, averaging better were low-seet of unkeep, and excellent resalts from both the points

#### Mack Saurer Hewitt

"Leading gasoline trucks of the world"

What do you know about a particular motor-truck-not think, guess, or estimate-what do you know?

The Mack, Saurer and Hewitt have been in use for 10 to 18 years - 7000 of them, all over the world.

We have history and facts-not mere estimatesof what motor-trucks cost and are earning in such businesses as yours, and this knowledge we are glad to give to any accredited representative of a business.

Capacities: 1, 11/4, 2, 3, 4, 5, 61/4, 71/4, and 10 tons. Bodies to suit every business, built in our own plants.

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Offices : Breadway and grift fit New York Works: Allenteen Pa; Flainfield N J Service Stations: New York, Chicago, Philadelphia, Boston, Claveland, Chainnest Bullio, Ballimper, Mounth, Philadelphia, Boston, Claveland, Chainnest Bullio, Ballimper, Mounth, Philadelphia, Boston, Calantia, Kanasa Chip Boston, Spa Transiston, Lop Angeles and other large cities line Sales Agents: The Chaelikas Thirthenti-Morro Compton, Linksid, Montreed

mangine, that he eventually cold, at year immediate, that he eventually cold, at year immediate, that he eventually cold, at year immediate, that he was not considered to the sum of the constant of the cons

year, be distincted in progress.

Nobel was very delicate in health from birth and his battles in making explosive possible were, from first to last, in the face of physical suffering that would have disred any but a man of superb de-tation. His life was largely spent in Scandinavia and in St. Petersburg. It was sixty years ago, that he first undertook the task of making the transportation and the task of manny the transportation and handling of nitro-glycerine comparatively safe. As Bessemer began his experiments with steel that he might develop greater strength in gun barrels, so did Nobel hegin his studies of explosives that he might

is studies of explosives that ne nega-evelop a stronger charge for use in them. Nitro-glycerine, when it comes in son-act with the hands, produces intense head-ches. Nobel, delicate, nervous and supersensitive, suffered intensely from heads in this way for the twenty-five at he handled the explosive. Like years that he handled the explosive. Law wise did he constantly run the risk of being blown to pieces by the materials that he handled. The tragedies that resulted from his efforts but which he escaped by accident, show the danger to which he was

Early in his investigations, he went far toward removing the danger from nitro-glycerine. Over and over again, he demon-strated in his very hands the safety from explosion of his pr sursout in ms very mands the sarely from Panama, San Francisco, and San Dies explosion of his product. Unquestionably his first steps went far toward accomplishing the great feat. Finally, a ship load of The Use of Agreplanes in Acts his preparation was started for Chile. In mid-ocean it blew up and recorded one of the great tragedles of its time. Because of this explosion all the world turned from mid-ocean it blew up and recorded one of the great tragedies of its time. Because of this explosion all the world turned from his invention and upon him. No one would use his explosive. There was even as effort made to make its transportation [Jiofe to sant hem. A number of succe-dent made to make its transportation [Jiofe to sant hem. A number of succeeffort made to make its transportation anywhere in the world unlawful.

Nobel acknowledged that his problem 

invention Venkins says, he has never been provided that the form manifest of plants of the sale.

Afted Nobel, the man who has dones the mass of the world's work toward the development of commercial explorives and has building, raifered building and kindred industries possible, suffered until the same of the world when the same of the provided that the from the same time provided that the from the same time previously the same provided that the income from it should, each provided who are making his world who did most for process. vents aomething of actual papasical, use needs but get in touch with keis people while should use it and his 'revence' to almost immediate. This is 'particularly' true of Anorston, where invention has done in much and where invelor is no futures, their each man is grauping for anything that will give him a small advantage over-the cival."

#### The Arlington Wireless Telegraph Station

WORK on the Naval Wireless Tel WORK on the Navel Wrestes Response Station at Artington, Vinginia, is rapidly nearing completion. On October 28th, the apparatus was put to a partial test. The signal N.A.A. of the Arlington Station was repeatedly finished Arlington Station was repeatedly finished in the effort to reach Key West, but for some reason it was impossible to read that station. However, when the receiv ing apparatus was tested, the operators ing apparatus was tested, the operates were able to take messages sent from the Marconi station at Chiffen, Ireland, a distance of 2,500 miles. When the Arlington plant is completed, and working under full power, it is confidently exp that communications will be estable not only with Key West, but with Panama, San Francisco, and San Diego.

### Warfare

anywhere in the world unlawful.

Nobel acknowledged that his problem
was not yet worked out and he labored for
the control of the problem
in the happened upon by secident. While
where the world is the problem
in he happened upon by secident. While
working his laboratory, he out his finger.
He sent out for collodien with which to
dress the wound. Collodien is made of gun
such as other. The combination is spread,
on a wound, the other immediately everyscoates and the drossing of gun octon is
light as next of artificial aim. After drossguidelin into some niero-glycerine with
which he was working. The other constant,
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he experimented with this academia flavor,
which he was working. The other constant,
he experimented with this academia flavor,
which constant is not the flavor of the construction of the constant of the construction of the constant of the con planes were used with excellent success by the Italians in the war with Tripell. On August 24th Lieut, Manzini fell into



# the Spanish Main

ave increased our service

### Cruises

the S. S. Moltke, January 23; February 25, March 9, 1913, and S. S. Victoria uise, January 15, February March 11, April 10, 1913.

### 2 Cruises New Orleans

many 23 and February 10 www. Steamships

Tour of the rient

from New York, Jan. 28,1913, by S. S. Cincinnati (17,000 Tons), an 80-day cruise, \$325 and up, including all landing

000Tops),110days,3650

Similars were pilots of Wright Siplanes. The letter, who was the pioneer Bussian sylator and the cited instructor of the made several exce Réspin army, made several strollent sisouths flights over the Turkish lines in the richnity of Adrianople. According to press reports, on the 31st ultimo, while scaring over this besisped city, his machine was struck by a schrapped shell and Popsoff fell to his death. A Furman biplane report rest to his death. A Farman biplane was used by the Greeks for scouting be-fore the invasion of Turker was decided upon. The country was flown over within a radius of 50 miles, and when no Turk-ish troops were found, the invasion was immediately begun.

#### Notes for Inventors

Twelve Eye-glass Patents.—The patents issued October 1st, 1912, include twelve patents numbered from 1,040,094 to 1,040,-105, inclusive, to Lee F. Adt, of Albany, N. Y., for eye-glasses or eye-glass mount-

mgs.

Dries by the Ald of Magnetic Field.—
In patent No. 1,040,486 William H. Allen,
of Cleveland, Olio, presents a method of
desiceating an organic substance by subjecting the substance to the action of a
magnetic field in a compartment and cirsulating cool dry air through such comrattment. partment.

Combines a Bettle and Drinking Cup.— Fortunatus F. Syracuse, of New York sity, in patent No. 1,039,848 shows a cup esty, in patent No. 1,039,845 anowa a cup in goblet form with a hollow standard communicating with the chamber of the cup and in the chamber is fitted, removably, a flexible and elastic hear whose neck is secured in the standard of the cup, the neck the communication and the hold of the hear king. being sealed and the body of the bag lyi

normally within the chamber of the cup.

A Fessenden High-frequency Electrical
Conductor.—Reginald A. Fessenden, Brant
Rook, Mass., assignor to National Electric
Signaling Company, of Pittburgh, in patent No. 1,039,717 presents a cold for highfrequency currents in which a strip conductor formed of a number of wires is
wound edgewise and the position of the
wires in the strip are varied in spiral fashion and in competite senses with the lenth ion and in opposite senses with of the strip and are also plaited

A New Toy Whistle .-- A toy whistle hav-A New Toy Whistle.—A toy whistle hav-ing two whistles upsoed apart like the ordi-nary tin, penny whistle and connected by a tubular bellows to retain the air and a spring within the hellows to force the whistles normally apart so that by non-pressing and releasing the end whistles rapidly, a practically continuous whistling sound will be produced, is diselected in patent No. 1,039,840, issued to Victor E Secavem of New York city.

Another Everflowing Bettle.—An in-clined bottle mounted on standards with that nearest the uptilted bottom of the that nearest the uptilised bottom of the bottle hollow and extended into the bottle and curving downwardly at its disoharge and to prevent aplashing in the bottle is shown in patent No. 1,041,149 to Chas. W. Nishols of Rahway, N. J. The bottle dis-charges into a small tank and a pump el-culates the water from the tank through the hollow standard into the bottle from which it pours into the tank.

which it yours into the tank.

Deable Compartment. Co a of i m a i
Helder.—Patons No. 1,099,739, granted
to Jasob Gottlieb, of New York city,
overs a conditions helder with a partition
to form compartment and a partition
to form compartment and a partition
to form compartment and at the compartments there is provided an instituted wall
which is revolutily mousted to revote
herisontally so that it can be set to shut
off one or the other of the compartments
and to convey the substance of the other
compartment to the silling the patchets call
or pepper can be discharged as with.

North Arguinements of Allering Melle Saste.



### Franklin Little Six—Thirty, Touring

A car of unusual beauty with all the smoothness, silence and flexibility of six-cylinder construction. Light weight, economical to run, easy riding, fast over the road. Exceptionally able with ample reserve power for every requirement. Five-passenger Touring car; Two-passenger Victoria-phaeton: Price \$2,800.

Victoria-phaeton." Price \$2,800.

As a Man of Affait you will be particularly interested in knowing why the Franklin has stuck so consistently to its distinctive principles of construction—direct air
cooling, light weight, full-fillipse springs, wood frame and large titres.

We have done so because it has been absolutely proven, under all conditions of
frietrely responsible for the numan treatly obtained from Franklin cars.

For example, Franklin cars use less gauoline, svenging from 20 per cent. to 35
per cent. greater milegae per gallom. This is the result of the exceptional efficiency
of the Franklin direct air cooled motor. Franklin cars average from 400 to 600
olling system. Franklin cars use fever titre. This is the result of high weight on
large titres, and because the titres are not pounded by rigd, supjelding construction.
Franklin cars usered faster in the long run, ride easier and last longer because of the
afock-absorbing properties of the full-ellipsic springs, realizent wood frame and ferThese principles are exchanged more full-wand. Pranklin construction is analyzed.

lible drive system.

These principles are explained more fully and Franklin construction is analyzed point by point in a simple, non-technical way in a book recently written by our engineers, entitled "An Analysis of Franklin Motor Car Construction." We will be glad to send this book, together with our caslogue, to any one who is seriously considering the purchase of a car of Franklin quality.

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TERE value in an automobile solely a thing of appearance, or of luxury, or of convenience, or of service, or of economy, or of dura-bility—the Marmon might be comparable to many other cars. But Marmon prestige is the result of the highest development of all these important factors. Marmon reputation - Marmon records—Marmon cars in service—all go to prove Marmon superiority.

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THE PARAMA CANAL.
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and its back is correspondingly effect, questiont of the middle seaf is no about that he will not cause any interference

spin energy operations.

Supplies Are Frenches—A patient, No.

\$100,011, has been issued to dishes D.

Eaflories of New York, N. T.; deep or a simply device in which there is doublined with a fire hose a nonzie and an arisestion device connected with the nosie at the discharge end thereof for drawing in air by the nessers of the water though the nessers. the passage of the water through the n the passage of the water through the nos-ile, a main sir-supply pipe being contacted with the suction device and tapping means being connected with the main air-supply pipe with distributing devices connected with the tapping means so that the air may be distributed to the firemen for breathing

#### Legal Notes

Difference Between an Assignment and an Option to Purchase.—Assistant Com-missioner Tennant in the case of Newman has decided that while the same of the entire interest in an application for of the entire interest in an approximation for patent may be permitted to prosecute such application for patent to the exclusion of the inventor, the Patent Office cannot recognize a party having only an option to

United States Cancels Three Pate By a decree of the United States District Court for the Eastern District of Pennsyl-vania, entered July 18th, 1912, in the case of the United States v. John Allen Heany, patents numbered 839,585, 842,546 and 572,936 were canceled and a copy of the decree has been recorded in the assignment records of the United States Patent Office. Heany was involved in fraudulent tra actions relating to the patents.

Patentability and the Dissolution of Interference.—In the case of Thompson v. Kiely, both parties were applicants for patent and were put in interference and it moved to duralize the interference on the ground that the issue is not patentable, does not warrant the dissolution of the indoes not warrant the dissolution of the in-terference if the examiner is of the opinion that the issue is patentable, and Assistant Commissioner Tennant said that if the parties do not wish to contest the question of priority they have a remedy by simul or priority they have a remedy by simul-taneously filing an abandonment of the invantion when the proper action will be a dissolution of the interference.

Trade-marks in China.—A dispatch from Peking states that the Government has under consideration a telegram re-ceived from the Chinese Chamber of Commerce in Shanghai requesting the pro-mulgation of a uniform system of regis-tration of trade-marks. W. Roderick mulgation of a uniform system of regis-tration of trade-marks. W. Roderick Dorsey, the Vice-Consul at Shanghai, in summarising the present status of trade-mark protection in China, ealis attention to the fact that although the commercial treaty between the United States and China of 1933 contemplated protection of trade-marks, patents and copyrights, to of disease and subjects of those countries. o patent laws have as yet been en and no Patent Office has as yet been established in China. Provisional regis-tration bureaus for trade-marks have been pened at the Shanghai and Tientsin opened at the Shanghai and Tientsin offices of the Chinese maritime customs where owners of such rights, either per-sonally or by their agents, are invited to, register through their consuls, and patents and copyrights are also received for A registration is first effected in reasion. A registration is first affected in the committee of the country of the appli-cant and is then sent on to the Commis-sioner of Cuctoms for registration in the provisional bureau. The result is merely a provisional registration grifting tanglish evidence of priority of claim of owner-skip to be countieded when rende-made, pasent, and copyright laws once hirts effect in China and application is made for actual registration. Walls the preoffset in China and application is model for actual registration. While the gro-trooften affected by this practice is none-write thritted as explained and cased in this state of the superiority of the superiority of Companies of the Superiority of the Superiority of Companies of the Superiority of the Superi



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Learn to Staff Birds and Astron.

Land of long Mary Politics. But you walked.

Bridge one hast. We profite the part of the land of the lan

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fraction Company

Sept. 13, 1912.

Within the last thirty days, se of one of these extinguishe

Yours very truly, Brie Traction Compa

Chas. M. Hatch

CM #/RM

Nore than a million people a day ride in the New York Subway. Figures show that 1,179,512 were carried in a single day. They are protected from fire by 5,877 Pyrene Fire Extinguishers.

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#### The Greatest Engineering Work of All Time.

feet square at the base and 400 feet in height—a mass in other words, which, as our illustration shows, would entirely cover in and shut out of sight, the new

Pennsylvania Terminal at New York and tower several hundred feet above the lofty

roof of the main hall.

The state of the s

The Chinese Wall has always been con-sidered to be a fairly big job of construction. It is fifteen hundred miles in length, and would reach from San Francisco to St. Louis. But the material taken out of the canal prism would build a wall 2,500 miles in length and of the same average thickness and height as the Chinese Wall, the structure reaching entirely across the United States. Again, the canal from shore to shore is only forty miles long, or fifty miles between the deep-water con amount of excavation would dig a canal 55 feet wide and 10 feet deep entirely across the United States.

Lastly, if all the excavated material were loaded onto flat cars it would form a dirt train sufficient to reach over four around the globe; moreover bore holes driven for blasting out this material, if placed end to end, would pas entirely through the earth.

#### The Sanitation of the Canal Zone (Concluded from page \$13.)

northern white races, without any appreciable ill-effect on either their physique or mentality. But their remaining in good health is conditional upon properly con-ducted measures of sanitary prophylaxis. The question is not "Can a white colony live and labor in the tropics?" but rather, "Can a white colony afford to undertake the sanitary work necessary to make it possible for its members to live in health?" The last question can only be health?" The last question can only be answered by a careful study of the condiffions in a given locality From the ex-perience gained in Panama, in Cuba and in the Philippines, we believe that in most places the cost of sanitation can be made to fall well within the boundaries of economic feasibility, if directed by a competent sanitarian. Whether or not the Cancasian race can permanently inhabit the tropics, continue a healthy vigorous race and maintain a high degre of culture is a question I am not prepared to discuss. That under proper conditions Caucasians can live long enough in the tropics to accomplish a predigious task of engineering, such as the Panama Canal, and do it without any great sacrifice either in lives or in health, has been demonstrated. To-day healthy and vig-orous American men work with snap and vim under the hot sun of Panama, play baseball, tennis and other games. American women do housework, play tennis. ride horseback and dance enthusiastically, and chubby little American children, born and raised in Panama, play on the lawns and attend American schools. We have earned how to live in the tropics.

#### The Electrification of the Panama Canal

for a considerable period will suddenly be called upon to operate and must perform its function absolutely without fail. To insure this the best of machinery and the best methods of construction have been employed. Very special attention has been given to the conditions of humidity the Isthmus and a suitable insulation for electrical machines to be used in such a place has been developed, after a study involving much expenditure of time and money. The prevention of corrosion of money. The prevention of corrosion or the metallic parts has also been given special attention.

For operating the rising-stem valves, 116 50-horse-power motors t amployed. The function of these valves out of the locks from the upper level through the main outverts in the side and

## Chief Croker and Chief Archibald



after witnessing actual fire tests of steel filing cabinets unreservedly declared that the best of them all is THE SAFE-CABINET

#### Ex-Fire-Chief Croker says:

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Sex of the best known double wall six of the oses known addition where successively placed in a specially constructed furnace. The most accurate scientific instruments for registering the external and interregistering the external and intertable was due to the separation of the wills)

and temperature were used. The
tests were conducted under the
supervision of Prof E. S. Merriam,
of Marietta College, who personally checked all instruments and readings

### THE SAFE-CABINET

(1913 Model)

was in the fire for 49 minutes, thirty of which averaged in excess of 1700 degrees Fahrenheit (estimated to be actual severe conflagration heat) actual severe connagration heat)
The internal temperature at no time exceeded 290 degrees F. At the end of this ordeal a fire hose was turned on its white-hot doors and outer walls. THE SAFE - CABINET was then opened and its contents were found to be uninjured Papers and currency, which had been placed in the cabinet before the test, were taken out in perfect condition The contents of the five cabinets

of other makes were in process of destruction at the end of periods ranging from 6 to 17 minutes, and on every case the destruction was completed before the completion of the test. Not one of the five of the test. Not one of the five was subjected to the fire for more than 28 minutes, some not more than 13 minutes

We have issued a complete report of these tests, omitting only the names of the competing cabi-nets. The accuracy of this report is a matter of legal affidavit. Write is a matter of legal affidavit for it. It is free

#### THE SAFE-CABINET COMPANY

Dept. Y.

Agencies in most cities.

Look in your telephone directory.

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One Quart and One and One-half Quart Sizes

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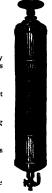
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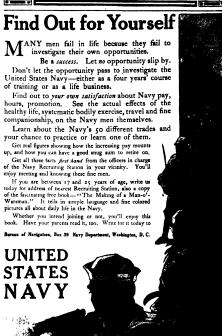
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center walls. A rising valve stem passess:
vartically through a straining box in a,
horisontal water-tight buildead, in this,
way clouding the bottom of the machinery,
chamber 32 feet below the high level of
the water in the lock. The upper end
of the valve stem is carried by a crosshead actuated by two vertical, revolving,
non-rising serven, the latter being driven
by a 3-phase induction motor by means of
a reducing gear from the horisontal shaft.
A solenold brake on the motor allows
it to be brought to rest immediately
should the line current be interrupted.
Arrangements are made so that the machinery may all be operated locally or
by remote control, and auxiliary hand
apparatus is also provided for closing the
gate. The current is cut off at the propor point in the travel of the crosshead by
means of a limit switch.

meens of a limit switch.

To operate the cylindrical valves, 7½ horse-power motors will be used. There will be 120 of these valves, 20 in each of the single locks. These valves control the flow of water from the culvert in the center wall and in the smaller lateral culverts beneeth the floors of the lock from which it rises through the walls into the lock chambers.

For the operation of the lock gates, of which there are 46 pairs, 27 horse-power motors will be required, one to each leaf, 46 74-horse-power motors will also be required for the miter-forcing machines which force the gates to come together perfectly and then lock them when they are in this position.

For the operation of the chain fauders, pumps will be used and 48 fob-one-spower motors will be used for driving these. In order to prevent a ship from ramming the gates in case of accident, these fender chains are stretched across the lock chambers in front of certain miter gates. When not in use these chains are plowed into a well in the floor of the lock chamber. An hydraulic pressure and plunger mechanism is used for lifting and lowering the chains and the water supply for operating their successful of the control of the

In case of damage to the gates or should it be desirable to make repairs, should it be desirable to make repairs, six emergency dams will be arected to check the flow of water through the locks under these conditions. These dams will be placed in pairs in the approaches to the upper locks about 200 feet above the unner guard gates, each one closing the approach to one of the single locks. The turning and wedging of the dam and the lowering of the wicket girders and gates will require four movements. The ma chines of this operation will be driven by electric motors with hand power possible for emergency use. Two 150 horse-power motors for turning the bridge and a limit switch to prevent operation beyond an arc of 90 degrees, will be located in the operator's house at the end of the short arm on the emergency dam. The wedges will be operated by a 25 horse-power mo-tor, and the bridge will be firmly held in place when it is at rest across the chan-nel or lock wall. A hoisting drum driver by a 25 horse-power motor with its equip-ment of limit switch will be used for raising and lowering each of the six wicket girders of the dam. The gates on the girders will also be lowered into place by the same means, gravity assisting the electric power. There will, therefore, also be six gate hoisting machines for dam, a 25 horse-power motor being used with each.

An electrically operated remote control from the center point will be used in connection with the various gates, valves, fender chains, etc., of the locks. There will be one such central control station for each of the series of locks at Gatun, Pedro Miguel and Miradores. The starting panels which will be placed in eich machinery chamber, will be equipped with contactors by means of which current will be applied to the motors. These starting panels will, in turn, be controlled from the central control stations at the lock sites. Some of the machinery chamber, will be \$7.00 feet from the politic effective contactors will be \$7.00 feet from the politic effective control stations of the section of the sec



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er a Year to Pay

be within 2,000 feet, and 50 per cent of the total within 1,200 feet. The switch-boards which are placed in the central control houses are being made to resemvery closely the plan view

The movement of each mach visually to the operator by an indicator mounted on a board which has the same relative location and is constructed to represent it in appearance and travel The motion of the machine itself is followed by these indicators in practically synchronism, and with a very high degree of accuracy. In order to further assist the operator and to prevent mistakes a mechanical interlocking of the individual switches controlling the various motor and contactor panels is used it being thus possible to operate in cor-rect sequence only the various gate machines, fender chains, etc.

The use of electricity in hauling the versely through the locks by means of electric locomotives is one of the most im-portant uses of electricity on the canal. Forty locomotives will be required and four will be used with each ship; two towing the ships, one on each side of the lock and two locomotives attached to the stern, one on each side for steadying the ship in its passage. The locomotives will have a drawbar pull of 3,400 pounds, and will tow the vessels at a rate of 2 miles per hour, and will return at a rate of 5 miles per hour. All of the towing tracks will have a center rack throughout, and a pinion in mesh with this rack will always be used by the locomotives while

In addition to the above-mentioned of electricity, we may name applications for lighting, telegraph system, fire alarm system, system for mining batteries, and, undoubtedly in the extensive fortifications which will be erected; other ficids will be found for its application. The use of electricity in connection with the canal has been studied most thoroughly in every detail by the engineers connected with this work, and with reliability of operation as the factor of prime importance. The whole installation will be a monu-ment alike to the development of electrical art and to the care and skill of the engineers to whom this work was

#### Result of the Gordon Bennett Balloon Race

S we go to press nineteen out of the As we go to press nineteen out of the twenty balloons which left Stuttgart on the 27th ultimo, in the Gordon Bennett race have been reported. The race appears to have been won by the French balloon "Picardie," piloted by M. Maurice Bienaime, with M. Rumpelmayer as aide This nerestat covered a distance of 2,000 kilometers (1.367 miles) in 46 hours, thus breaking the world's record of 1,211 miles held by M. Emil Dubonnet, as well as the record of 1.172 miles made last year in this race by Alan R. Hawley, when he traveled from St. Louis to the wilds of M. Blensimé landed at Riazan, near Moscow. The French "He de France," piloted by Alfred Lablanc, also landed in Russia, about 125 miles short of the distance covered by the "Picardie." The third French balloon, the "Bearn," and the English "Honeymoon" appear to and the English "Honeymoon appear to have tied for third place with 1,800 kilo-meters (1,118½ miles) to their credit, the "Uncle Sam" being next with 1,056

The third American balloon, "Düsseldorf II.," piloted by Mr. John Watts, who had Mr. Arthur T. Atherhoit as aide, had not been heard from up to November ist, and it was feared this Gorman aerostat, which was loaned the American at the last moment owing to a defect de veloping in their own, had been lost

at sees.

This is the first time France has won
the international balloon race, and no
doubt her aeronauts will make every
effort to keep both the balloon and aeroplane trophise at home in the future. No
less than unine countries competed this



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that there must have been other camera
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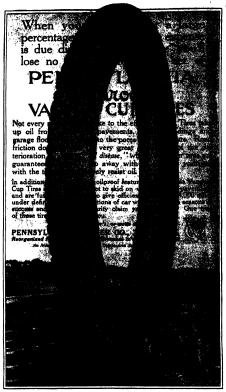
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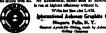
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please to freeze sooner than he cold-water place.

(12660) B. N. K. asks how to make sheet
war. A. 1. Take of pure, class war, anywhere
from 1 to 3 pounds, put in a the bucket or any
deny wasse, with claser water andirects to fill it
thoroughly melted, them set asket until partially
coulded, siem all the air bubbles off. Then fill a
smooth, straight bottle with lew water, a buckets of
which you should have by you should be applied to
which pour should have by you soon as the wax
hardons to withenous, cut a line through it and
remove it from the bottle as quickly as possible
figured to root, and straighten out smooth while
remove it from the bottle as quickly as possible
figured to root, and straighten out smooth while
reads thus cheeke. 2. Adds except wat in hot water,
and add nighturis acid, 30 minimus to each pound
of wax. Bold for 2 or 3 minutes. Cool, and
remove it from the 2 or 4 minutes. Cool and
of wax. Bold for 2 or 3 minutes. When the
stand add a few drong of turpenties. When the
content is a supplied to form models of desired size
byte a giase rolling pin, and coase with cospeton.
Four the models was into the mands and pass the
rolline frontly over the wires.

consider the state of the state

(1208%) B. J. C. asks how to soften horn.

A. The hony core of the horn is first removed; the
next process it to cut off with a saw the thip of the
next process it to cut off with a saw the thip of the
used by outlees for kaife handles and enactry other
purposes. The remainder of the horn is left entite, or is swen across into lengths, according to
the use to which it is declared, both properties
the test of the contract of the contract of the
tie actiened, and white will hot is held in the
flame of a coal or would fee, taking cave to bridge
the inside as well as the outside of the horn. If
is kept there till it acquires the temperature of
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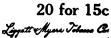
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Van Nostrand Company, 1912. Svo; 330 pp; map in pocket book. Frice, \$3. All who have over visited the American Mossum of Natural History and seen the arrangement of the miscrale, must have wondered at the enudiation of the cursor. Prof. Gratacap, Il has one that word, as well as being one of the best. Therefore, when Prof. Grasacap states out to combine a popular guide to miscrale and a description of combination. This is a scientific book of their combination which is a statement. The present book, making, it is not the statement of the theoretical part of the subject, but with the cuttant specimens as well. Frof. Gratacap proportionation have been very acceptional for degree. The volume before us it is handown piece of book making. It is filled with half-tone sugarwings, mostly from the Bennia collection piece of book making. It is filled with half-tone sugarwings, mostly from the Bennia collection to the minerals as well as they can in monochrome These is an excellent example of color printing from the Bennia collection of color printing from the Bennia collection of color printing the printing of the pr of a mineral—chodonite—which is used as a frontal-pice in the book will be of great use to invisitors to public cabinets of minerals, and for returning the picture in the cover of the book, which shows the distribution of minerals in the Ottor in the cover of the book, which shows the distribution of minerals in the United States in the picture in t

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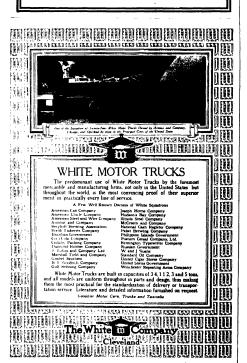
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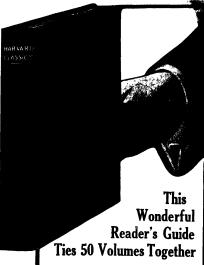
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### SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, NOVEMBER 16, 1912 Published by Munn & Co., Incorporated. Charles Alies Munn, President Prederick Converse Reach, Respective Act Pressurer all at 81 Receivags, New York

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The Editor is always glad to receive for examination illustrates articles on subjects of timely interest. If the photographs are marriate articles done, and the facts outherstic, the contributions will the articles will be paid for a regular space? class.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### The Peril of the Short Crossover

HE letter of the vice-president of the New York, New Haven and Hartford Haitroad, which we publish on another page, calls to mind the story of the barrister who, on asking his solicitor for the brief, received the answer: "No case; attack the counsel for the plaintiff."

For it so happens that our article "The Portla of the Short Crassover," which has litten as desply into the sensibilities of the New Haven Mailroad as to age gest that it must have come very night the truth, was not written, as our correspondent suggests, by "a support critic, who doubless derives his knowledge from some relative in the railroad houlines," but by that very Editor of the Scoutzur's Americas to whom the letter is addressed, who, as it so happens, was formerly, for several years, a member of the engineering staff of one of our railroads, and who wrote the article referred to after consultation with several brother engineers of high standing, and after a careful personal examination of the seese of the week.

The New Haven Hallroad, through its vice-president, complains that the writer did not follow "the accepted practise of reputable journals in previously submitting a proof" of the article "to the railroad company for criticism and comment."

Here is news indeed! We had always supposed (and still believe) that reputable journals, such, let us say, as Engineering News and the Rollings Apr Gazetie, many that the property of the Rollings of the Rol

We have approached this subject of the Westport disaster in a sections spirit, and with a sense of the responsibility which the gravity of the accident dermands. The letter of this official of the road dis seressite and is concluded in terms of levity which are strangely inconsistent with the sections relation in which the company stand in this matter, both to the public and to that admirable holy, the Interstate Commerce Combistion. Our articles advanced a theory in regard to the causes of the accident. Does this official of the railroad throw any light upon the subject does he show any 46-fet to expose the fallery. If there he are, of the theory we have advanced? Rather, he reserved makes the outline of the swaying becometre resemble agyrating bronce. We have been serious in our efforts to discover the cause of the discram we published to discover the cause of the discram we published to discover the cause of the discram we published to suggestive of a backing bronce or not; but it is very material to discover why the locunotive should have beaved like one. On this total negetion the letter

necased like one. On this vital question the letter we publish melatinians a significant stience.

As to the question of the higher speeds permissible on a number 20 crossover, as used on the Pennsylvania Bullroad, we must ask our correspondent to believe that our information was derived from an official in the

Engineer Department of that road, who outranks those quoted by Mr. McHarry. The speed limit of 35 miles per hour may be on the time cente; but if so, it is more honored in the breach that in the observance, as any person who travels between New York and Philadelphia can see on any day of the year. Diaaster on a number 20 might arise from the failure of the rails and fastenings to stand up to their work, or from overturning due to centrifugal force. That the track would not fail is proved by the fact that the heavy engine passed at nearly 60 miles an hour through a number 10 crossover at Westport without leaving the least visible signs of undue stress that the writer could detect. That centrifugal force would not overturn a train at 60 miles an hour or over on a number 20, where the thrust would be only about one fourth as greet, may be proved by a simple calculation with pencil and µ0.

We are very giad to learn that the New Haven road has been lengtheding some of its crossovers. This was urred by the Souvernero Assances as an about necessity after the accident at Bridgeport, some fifteen months ago. The question, however, is not one of the road of the control policy of the road sizewhere on its lines. What the benearing Assances has asked, and still asks, is: White the Control Assances has asked, and still asks, is which the Control of the Souverner at Bridgeport, did not the New Humber 10 crossover at Bridgeport, did not the New Jones of the Souverner and the Souverner at Bridgeport, did not the New Jones of the Souverner at Bridgeport, did not be New Jones of the Souverner at Bridgeport, did not a number 15 or 50, and why did they leave in that three similar consovers, on one of shirtle the recent in the research of the second did not not strategie the second since the similar consovers, on one of shirtle the recent difference and the second difference of the second difference and the second diff

one of which the recent disaster occurred?
We are streetly interested to learn that in the present case there was a distant signal set at "caution" that a conductor, a towerman, a section forman, a home signal set at "danger," and a dwarf signal, failed in their combined efforts a arrest the speed of the train—for it sill goes to prove the strength of our contention that the mere laying down or rules of speed will not effectively safeguard a train sgainst inherently perilous crossovers, and that it is the duty of a rail-road, therefore, to eliminate from its tracks, as far as it can, all possibilities of disaster due to disobedience of orders or to the physical failure of the engineer simply accentuates the argument that trisk due to human failthillty should be reduced to a minimum by making the layout of the tracks, as far as is

economically possible, "footproof."

Regarding the latter part of the letter, which do concern directly the plea in our issue of October 26th, we have this statement to make: The Scientific American is not in sympathy with legislation, which, in some parts of the country, has been directed agains the railroads, simply because they are rich. It is no in sympathy with drastic emotional legislation aimed at railroads for political effect. We are aware of the fact that the railroads have fared badly at the hands of certain demagogues, and that in some cases they have not obtained just treatment. The SCIENTIFIC AMERICAN admired, beyond measure, the courage of the Governor of New Jersey, now the President-elect of the United States, when he vetoed a bill during the past year, which he considered imposed an unreasonable and unjust burden upon the railroads passing through that State. The SCIENTIFIC AMERICAN STANDS justice and fair play on the part of the political parties toward the railroads; but at the same time it smands that the railroads shall secure to the public the highest possible safety of travel. When a railroad fails in this respect, it shall be the self-imposed task of this paper to try, honestly and impartially, to ascertain the reasons; to point out the le tain the reasons; to point out the reasons or suca accu-dents as that at Westport, and to suggest the proper remedies. The bucking of that bronco of a locomo-tive—to use the felicitious phraseology of our correspondent—on a number 10 crossover was no wanton act. When it left the tracks it did so in obedience to the inexorable laws of centrifugal force. It is for the proper authorities to determine how and why it became possible for those laws to be so disastrously defied, and to enforce such changes in track construction that any repetition of the Bridgep sters may be rendered physically impossible

In conclusion and in proof of our impartial attitude in this discussion, we wish to state our conviction that in four-function and in proof of our impartial attitude in this discussion, we wish to state our conviction that the four-function system of the New Haven Riskillend between Woodlawn and Bridgsport is one of the finest verse in Woodlawn and Bridgsport is one of the finest articles or for do in the world. With its 100-pound rail, its fit-plates on every the associated with screen tools in place of the archaes give, and the deep hed of, broken-stone bullist, it presents an example of absolutely inst-class construction that is a delight to the eye of the engineer. By the very measure of that corelises does the presence of these aboundable short crossovers, with their electral meance to the safety of the date trails, appeal to the engineer as a lot upon an otherwise exceedingly fine example of high-class American right of our properties.

Entandantific Publishers

RUE attence to selections both case and careers and her votarion from any of the careers and her votarion from any of the careers and practical means. There have been destinated doings assumed to be adentific that would have been expedited into a to adentific that would have a located and may bendes possibly have instructive point. An illustration nature lower (and not d, makes by any means) becoming interested in the, query wifter does a measure or these to bouch a frue?

An illustrious natures lover (and not a natures to year years) becoming interested in the quasi-way does a mosquito refuse to touch a frug way man an a vittent were to the stimulations both these pests, rightly concluded no fair sine-could be given the question until it was described in the property of the mosquito does really make this blessed say that the country of the mosquito the training the mosquito the mosquito host. His hand was most generally ten, while the frog had never the slightest consult to scratch himself. One is here reminded of Hithernian sentiments who had his dog all night in sanw to freese it. It seems sever to have coursed our nature lover to have saved himself those dreadings by wearing a giver solut mosquit to be imposmented even to mesquitons. Nor for all his petag did not nature lover to have saved himself those dreadings by wearing a giver solut mosquit to be imposmented even to mesquitons. Nor for all his petag did not not be the properties of the state of place. There seems to be an unicable rejuditorally, a sort of business understanding between them, the mosquitons; but this seems to be done genistry and without heat, fare the fashion of the companionable wairus in "Alice in Wonderland," from the companionable wairus in "Alice in Wonderland," both the state of the seems to be done genistry and without heat, fare the fashion of the companionable wairus in "Alice in Wonderland," both the state of the seems to be done genistry and without heat, fare the fashion of the companionable wairus in "Alice in Wonderland," joint presence in marshes has been so detriminated the visible and working supply of the latter. They joint presence in marshes has been so detriminated the visible and working supply of the latter. They joint presence in marshes has been so detriminated to noctural comfort and to the value of merry residence decides decide not undavorably to the marsh desires and the state that some personably they epicy seech other's songs—a penchant not generally shared by their human n

Another "scientific gent" a resident of the centre belt, was some time ago (possibly still b) and under the belt, was some time ago (possibly still b) and the belt, was some time ago (possibly still b) and the belt has been his favorite food; he has been the favorite food; he has been eating it, drinking concections of it, taking it in soup and one-lett and saind; and he gained weight in the fortnight when he lived exclusively on cactus. Nevertheless he has, no doubt, long before this, found the habit an absurdly expendive one; and any concus-acting coult, unless it be made up of millionafres, must inevitably die out for the monetary reason alone. It was some time ago reported that a fellow-citizen has made a will consigning his body, after his death, to various mechanical uses. Buttons are to be made of his bones; leather bags of his skin; fiddlestrings of some of his more intimate internal relations. This gentleman proclaimed himself a utilitation, determined to practice his creed to the very death. Yet his phillosophy is really not utilitation. For the bone button marked its now so world supplied, these articles sometimes get into places where they certainly have no business—Inia idultifuals would care to buy and have it is not dearth of fiddlestrings—more's the pity. And whot turned individual would care to buy and have not be an expense. In point of fact, it was not accust more to transfer the morrial remains of this pseudo-utilitarian into merchandise than the product would brign in the open market.

### The Hardened Copper of the Ancients

T is commonly supposed that the ancients succeeded in hardening copper. Metallurgists who have examined specimens of this so-called hardened copper have found that it is not pure copper, but usually an alloy of copper, either natural (that is, the two metals existed in one ore, so that in the process of reduction as alloy was formed) or-an artificial aitoy made by melicing two ores together, the one copper and the other size. The so-called Mooni metal, now a reunitar profunct of an eateurn copper reducer, is the modern acquireless to the scholent natural ailor—a compound of copper and nickel obtained by reducting the copper-nickel ceni of the Sudderry planes in Ontario. All the arrowheeds said other templements which shave been frough in the displaced of the sudderry distinct of the suddern said the surface of the suddern said the suddern supplements which shave been frough in the displacement of the suddern said the surface of the suddern supplements which shave been frough in the displacement of the prediction of the suddern supplements which shave been frough in the displacement of the prediction of the pred

#### Mostricity

Trails on an Electrical Railway.—The Sains by excelsion in electrical apparatus last year inhitry-three shootic locomotives operating in the York terminal district of the Pennayivania Railrod railysis to only 15 minutes. The total mileage our sain locomotives was 600,000, including a mileage of 0 for a single one of the locomotives.

100 for a single one of the boomotives.

Sometimes of a Bind Address.—The highest tolephone from it the world, scoording to a German paper, is in the motoerological observatory on the top of it the motoerological observatory on the top of the paper of the paper of the top of the paper of the paper of the top of the paper of the

Sectice Power for the St. Gothard Tunnel.—Accordty Dr. Kumme's calculations for the amount of gover which is needed to operate the St. Gothard line and tunnel on the electric system, the total cost for the gover-plant work will be \$14,000,000, and the current is obstand from the Geschenen, Annalig and Ritom hydraulie plants. It is proposed to operate separately the socians lying north and south of the tunnel. About 30,000 horse-power is needed on the north side and 37,000 on the south. The slove hydratule plants could be called upon for 95,000 horse-power. The electric line will be best appeared on the 15,000-voit alternating current system.

Russing a Reifread with Wireless Time Signals.—At the St. Questin station on the Northern Railroad in Prazon there has been installed a wireless tedgraph station for receiving time signals from the Eifel Tower station for receiving time signals from the Eifel Tower station for the have the cause times and thus both The distance from Paris Is about 55 miles, to that the time signals are will received even with the small serial und. No doubt the railroad will extend the use of the wireless matched in the future. A station which is so equipped can also send the time over the ordinary teleerant lines to other railroad stations.

Blectire Heast for Shrinking on Wheel Rima.—Although the cost of electricity for heating is generally higher than the cost of related to accomplish the object by ordinary methods, electric heating for special mechanical purposes often shows a distinct operating commy due to the common shows a distinct operating commy due for an electric heater for shrinking on wheel rims, constaiing of a build-up; inor in; and with grooves containing a heating coil traversed by an alternating ourrent and adapted to be laid in contact with the rim that for to extract the contact of the rims of the contact of the switched off in the heater, allowing time for the wheel body to be got ready for insertion in the rim. As compared with a gas fire, two or three times as many rims on he shrunk on in sight sufficience.

Conservation of Heat Energy in the Ceal Pite.—
Bestrical engineering is constantly at work seeding to transform the largest possible percentage of the total available heat energy in coal into electrical energy, and to this end has endeavored to improve the efficiency of steam engines, steam turbines and internal combustion engines. Another way to conserve the heat energy of the coal used under the steam boiler is to protect this fuel from detectoration of the value that it has when purchased, that is, from the loss of heat units, during long storage, by exposure to the six and also by spontaneous firing of coals containing sulphur. An Indianapolis electric light company has devised an under-water coal storage pit containing 25,000 tons, of which 15,000 tons can be submerged. This pit, which represents an investment of 260,000, will be filled by gravity, thereby limiting the cost of handling the coal to on transfer.

Rectricity on Italian Ballevada.—Some important changes are being made on the Millan-Gallatase-Forticework electric railroad in the north of Italy. This into over the point of adoption the term of Italy. This is now on the point of adoption, which converges the point of adoption of the point of adoption that it is not an interpolate to the accordance of the first to be installed in the country, and it is now on the point of adoption of the point of the poi

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#### Science

New Heat-resisting Glass.—While the new variety of glass known as quarts or add glass is valuable from the fact that it resists heat and does not crack when suddenly hasted and cooled, so that various apparatus can be made of fs, such glass has a tendency to crystallize when heated for a long time near the melting point. This makes the glass mechanically weaker and it changes more with heat. A new glass made by M. Thomas does not become de-vitrified in this way, and he obtains it by using silics to which is added a small amount of evertain metallic oxides, these being acid oxides, especially zirconium or titanium oxides. As small an amount as 0.1 per cent is enough to increase the mechanical resistance by 20 to 50 per cent, and the general properties are much superior. He considers that the glass contains a colloid solution of the oxides, so as to hinder crystallization.

Corresion of Alaminium Kitchen Utenstia.—When aluminium is now frequently used for making kitchen utensils and the like, but these are noticed to become corroded without sotual usage, as for instance when keeping is atores. Tests made in Germany on the subject are intended to show the condition of the rusting or rather differencemen on the metal, this being produced by oxidation. When the coast is removed, the metal is seen to be more or less deeply scored. Analysis shows that the coating contains aluminium, lime, silica and magnesia. Sheet aluminium was exposed to the action of distilled water or ordinary water, and this gave a more or less rapid stacks. This was loss rapid when the place were placed in air and water in turn, but surface condation also coourred. It appears that the water must contain oxygen in order to attack the metal. The effect increases with the heat and also in the presence of carbonic acid.

Taxeling and Exploring in Siberia by foreign men of science, although not prohibited by the Russian government, satalis a good deal of preliminary red tape, according to information on this subject furnished by the American constant at Valdivotok Permission should be requested through the embassy at St. Petersburg several months in advance. The number and kind of guns that one desires to bring must be specified, as the importation of frearms into Russia without special permit is contrary to law. Visits of foreigners to constal Siberia are not looked upon with favor by the authorities. The sportsman is reminded that the hunting of ashle has been prohibited throughout Siboria and the Russian Far East for three years beginning February 14th, 1013. The best plan is to make trips under the authors of some well-known scientific body, rather than on one's own resconshibity.

Changes on Jupiter.—During the greater part of the D192 apparition of Jupiter the northern equatorial batt of the planet has been abnormally faint as though partially obscured by a film of vapor. On August 22rd a dark spot was observed in the region of this belt, approximately in longitude 125 degrees. The disturbance seemed to increase rapidly, apparently spreading in the direction of the rotation of Jupiter, and its mean rate of motion has been greater than required for system in the direction of the rotation of Jupiter, and its mean rate of motion has been greater than required for system in the disturbance seems to be chiefly in the latitudes of system II. Its progress was such that by Cotober Th the disturbance secuted more than 287 degrees around the disk of the planet. A few days prior to Cotober 5th the disturbance civiling and of the area had made a complete ofewirk around Jupiter and from resent observations the whole northern equatorial belt has apparently been eleased of the white matter which to obscured it. This belt is at present a competition of the feature of the planet. The appearance of intensely dark condensations and the rapid proper mutous of the belt seferond was somewhat spectatured.

Servering the Genge Region.—The use of modern unshools for laying out frontier lines in the molonies is well brought out in the work which is being done in the Congo region. According to a recent treaty. France coded a certain amount of territory in Arica to Germany in exchange for sconcessions in Moreoco, so that this led to expeditions on the part of both countries in order to fix the boundary lines. Capt. Penquet states that wireless telegraphy will be used for the first time on a large scale on as to determine latitudes exactly. Wireless statuons now exist in the French possessions, also in Cameroon and Bedgian Congo, and all these are to be utilized by the expeditions. They will carry improved kites for mounting the antenna wires, also the necessary wireless posts. For taking the latitude they use prism astrolates which give very close restiles. These measurements will be combined with plans drawn up on the spot by the alidade, this latter being used especially for the important points. Once in passession of the data, they will draw up a may of the frentier region on as large a scale as a possible. Other selectified work will be done at the same time, which is likely to be valuable, such as hydrography, corporphy, questions of population, botanical and eshnological research, terrestrictly amportant and the like-

#### Aeronautics

An Aerostructural Balance.—For automatically balancing an aerostructure, Roy M. Palmer of Washinco, D. C., in a patent, No. 1009,181, presents in connection with allerons a shifting fluid column and an electrically operated means connected to the allerons and having a series of superunposed electro-magnets, the abifting of the fluid column operating to energize the electrically operated means to shift the allerons to various inclinations. An arrangement is also provided to maintain the alerons at the proper point when the fluid column returns to normal position.

Paris Aero Show.—The fourth acronautic show to be held in Parus was opened on the 20th ult. by President Fallières, sansted by the Ministers of War and of the Marine. Sirry of the latest acroplanes are on exhibition, while but two hallons and no arrhips are to be seen. The show is given up almost entirely no of the navy. The chief of the later is the Astra biplane which won the St. Malo moving. This machine is made entirely of metal and the float at the rear end of the fuschage forms a rudder so that the hydra-croplane can be stered when running on the water. The exhibition of accordant motors is a large one, the most noteworthy of these being the 400 forms-power motor of the Astra-forces dirighted for Given Britain. The War Department, besides showing acroplanes and their component parts, has on exhibition that distinguish the substitute of the Astra-fix, has one exhibition that the Scientific Astra-fix has the substitute of the Astra-fix, has one chromosthy and the proposed parts, has one conforment hydro-accoplane exhibit. The Scientific America hydrographs of the principal exhibits at the Show, an article that will critically point out what is good and what is bad.

Fatal Balloon Accident in Germany.—While trying out his new balloon preliminary to the Gordon Beanest race, on October 20th, Levit. Hans Gereke, the well-known German acromant and the winner of the Bennett race last year, fell to his cleath with his aide as a result of his balloon burning when at height of John 50 miles. Leuit. Gereke, soon after he started out and while at an elevation of about 6,000 feet, approached a thinder shower and was eaught by a sudden upward current when carried the balloon to a height of 15,000 feet in a very short period of time. Either on account of the rapid expansion of the gas, or because it was struck by lightning, the balloon burst and the two men fell to their deaths at a terrife speed. This accident provise that no matter how experienced the pilot or how well-built the balloon, there is an element of danger in ballooning that is not mat with by the heavier-than-air machines. It would seem that balloonists abould be equipped with a safety parachute, such as has recently been invented by A Leo Stevens, so that in case of such an accident, they could jump out of the basket and descend asfely to earth.

New Records with Model Aeroplanes in America.—As mentioned in a recent issue of the Scientific American, number of new model aeroplane records were made at the Aeronautical Society's exhibition on Staten Island, on October 12th The chief of these was a duration record for monoplanes launched from the hand of 158 4/5 seconds made by Armour Selley of the New York Model Aeroplane Club Young Selley's model soared 40 feet high and traversed a distance of over 2,000 feet before alughting. The best previous record, made in England, alighting. The best previous record, made in England, was only 1,431 feet, though Selley's model flew 2,653 feet at Mineola last summer. The American duration record for a flight from the hand. 91 2/5 seconds—was record for a flight from the hand 91 2/5 seconds—was broken four times on Columbus Day, it being raised respectively to 92 1/5 and 96 2/5 seconds, 119 2/5 seconds and 158 4/5 seconds. The record-holder young Selley, who, with a model 40 inches long, fitted with but fourteen strands of 1/8-inch wide, flat rub-ber bands, made a remarkable flight of 2 minutes, 38 4/5 seconds duration, thus broaking by 55 4/5 seconds 38 4/5 seconds cursaion, thus preaking by 35 4/5 seconds the world's official duration record in the composition for monoplanes over 4 feet long, starting from the ground, George A. Page, Jr., of Hillsdale, N. J., made a new world's record of 585 feet. In a similar competia now world's record of 385 feet. In a simuse composi-tion for models under 4 feet in length, H. Schultz won the first prize by a flight of 726 feet. At a second meet, held on Election Day, Selley's model, resting on skids and starting from the ground, flow 1,408 feet, while George A. Kavanah's flow 1,400 feet. The best record and starting from the ground, new 1,465 rea, while George A. Kavanah's flew 1,400 feet. The best record of this kind—1,184 feet—was made by Dr. Dedderer some time ago. Selley's record-breaking model, and in fact most of the models used this year, are mono-planes with a small guiding surface far out in front on a triangular (in plan) fuselage, the distinctive reature of the American models being that they all use propellers at the rear instead of tractor screws. A properers at the rear instead of tractor screws. A tremendous advance has been made by American boys during the past year in the construction of model acrophanes, and it is wonderful indeed to find that a good sized model can be propelled half a mile through the sir by means of a few clastic bands.,

Launching Ships by Trigger

I N the launch of the battleship "New York" recently
at the New York Navy Yard, Brooklyn, a departure was made for the first time at this yard, from the time honored method of releasing a ship by sawing through the timbers which prevent its movement down the ways.

The work of launching the ship with all the careful preliminary preparations was done under the immediate supervision of the chief naval constructor of the yard, Robert Stocker, who was responsible also for the building of the "New York," the immediate over-sight of which was delegated, as we stated in our article at the time of the launch, to Naval Constructor

John E. Bailey.

The "ways," which play such an important part in

the launching of a ship, are of two kinds: the ground ways and the sliding ways. The former are permanent and immovable; the latter are temporary and move with the ship to the water. The ground ways consist of two lines of heavy longitudinal timbers, one on each side of the keel of the ship, placed about midway between the keel and the turn of the blige. They are laid upon lines of piling, which are driven down to a firm bearpining, which are driven down to a firm bear-ing, with a carrying capacity sufficient to hold up the ground ways firmly in place, and insure them against any settle-ment under the great load of the ship. Laid immediately upon the ground ways are two similar lines of longitudinal timbers which constitute the sliding ways. Between the faces of the two ways is placed, for purp of lubrication, a heavy coating of grease.

The launching weight of the "New York"

was 10,000 tons, and the inclination of the ways resulted in a heavy thrust which had to be resist-

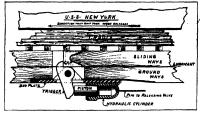
ed until the moment arrived for letting go the ship Under the old method of launching, the siding ways were locked to the ground ways by two heavy balks of timber. In launching, cross-cut saws were used to cut ough these timbers and so release the ship.

Under the new method, as shown in our illustration, under the new menon, as shown in our instantion, as anown in our instantion and an amsetive steel tripper be pivoted in the ground ways, and in its normal position engages a cap set in the silding ways. It is maintained in place by a hydraulic ploton. When the signal is given to release the ship, a releasing valve is turned, and the giverin in the hydraulic cylinder is allowed to escape. The pressure in the cylinder being removed, the trigger swings on its pivot, disengating the cap, and allowing the ship with its cradle and sliding ways to move down into the water.

#### A Forty-mile-an-hour Dreadnought By F. C. Coleman

THE British battle-cruiser "Princess Royal," constructed and completely equipped for service at the Naval Construction Works, Barrow-in-Furness, England, in covering a measured mile during her trials at 34.7 knots has established a world's record for ve her class. She is 600 feet long between perpendiculars,

88 feet 6 inches beam, and, with a draft of 28 feet, has a displacement of 28,250 tons. Like H. M. S. "Liou." she is the largest cruiser yet built for the British Nary, and is also the broadest, excelling even the "Lusitania" and "Mauretania." The eight 13.5-inch guns in the "Princess Royal," as in the "Lion," are much more and "Manretante." effectively disposed than in the earlier armored cruis-ers. Forward there are in the center line two twin-gun turrets, the one to the rear being at a higher elevation, that its guns fire over the turret in front. ships in the center line there is one twin-gun turret, and aft there is another. Thus all eight guns fire on either broadside. Four fire directly ahead, but by iving a slight angle of helm the ship may alter her course sufficiently to enable all eight guns to be utilized



The hydraulic trigger used in launching the battleship "New York."

in chasing the enemy. In the "Conqueror," which be longs to the "Orion" class, there are ten 13.5-inch guns, arranged two pairs forward and two pairs aft, the rear pair in each case being at a higher level thun those immediately in front. The remaining turret is in the center line amidships. There are in both the "Princess Royal" and the "Conqueror," sixteen 4-inch breech-loading guns for repelling torpeto-hoat attack; these are located on the superstructure deck. In the matter of armor protection something had necessarily to the protection of the superstructure deck. sarily to be forfeited in the case of the "Princess Royal," in order to insure the exceptionally high speed required by the tactician. This is, perhaps, the only point, with the exception of the omission of two of the primary guns, which differentiates the two types—the battleship and the armored cruiser. As in all warehips, there are three tiers or strakes of armor-plating. the thickness of the water-line strake in a battleship is 12 inches, the remainder of the upper deck being 9 inches or 8 inches, the "Lion" has, for the water-line and for the strakes above it, 9 inches of armor. The gun positions are also well protected. Forward and aft the thickness of the broadside armor is reduced by gradual stages to 4 inches. It will thus be seen that the "Princess Royal," notwithstanding her exceptionally high speed, has armor which is superior in its resistance to perforation by modern guns to that of

pre-dreadnoughts; in fact, with their legand a 28 knots, as compared with the 17 and 15 knots earlier ships, the "Lion and the "Princess Bio well as the "Queen Marry," now being built by Palmers at Jarrow-on-Type, could steam reund of pre-dreadnoughts and fire when it satiod thes ing beyond the range which would enable the ip guns to penetrate the armor of the er. It is often said, of course, that person arily be considered, but it is reasonable to as that the efficiency would be of as high a s the new ships as in the old, especially as in the fo there is superior gun-control and sighting mee which will insure greater accuracy in service. principal steam trials included a 24 hours'

two thirds the total power, and an 8 he run at full power. Both tests were course, carried out at the service draft under limiting conditions as to air p sure in the stokehold. The coal consump on the 24 hours' trial was 1.18 pound shaft horse-power per hour for all purposes. The power of the 8 hours' run exceeded time required by the contract, and the speed also considerably in excess of the d rate, notwithstanding that no attempt we made on the official trial to test the maximum steaming capacity of the bollers.

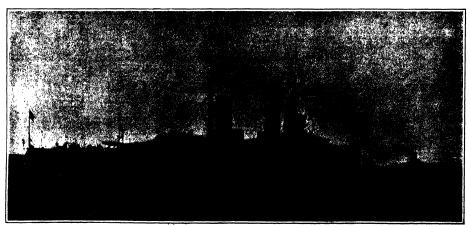
The "Princess Royal" and the "Lion," be-ing alike both in respect to the form of hull and the propelling machinery, the British Admiralty ordered at the outset two sees of propellers for the "Lion" and two sets for the "Princess Royal." The "Lion" carric."
ried out duplicate tests with the respective
propellers, and the second set was fitted to
the "Princess Royal," and she carried out the meas-

ured-mile trials, corresponding exactly to those the "Lion" with the different sets of propellers. The results of all four sets of trials will enable the Admiraity to determine the most suitable dimensions of screw ellers for this type of ship, and these will be utild in both ve

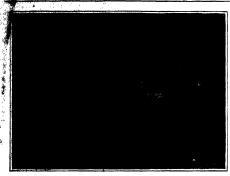
Upon her full power trisls off Plymouth the "Princess Royal" attained the high speed for a vessel of ber class of 32 knots. But that was not the best she On her return, she was dry-docked at Devonport and her propellers were changed. She coaled and went out again for six runs at three fourths and then at full power on the Polperro measured mile. On the last-mentioned occasion, it is authoritatively stated that she reached a speed of no less than 34.7 knots and made an average of 33 knots, which establishes a world's record for vessels of her class. It may be recalled that the original maximum speed of the "Lion" was 20 knots, but that she subsequently made 31.7 knots

#### International Show at St. Petersburg

THE Imperial Russian Automobile Club is organiz-ing its fourth international automobile show, to be held at St. Petersburg next spring. The show is to The opening date last fifteen days. but will probably be between April 17th and May 7th.



The 34.7-knot battle-cruiser "Princess Royal."





Receiving a deposit of gold.

Weighing gold on assay balances.

### How Gold is Bought

#### The Methods of the United States Assay Office

By Jesse Simmons

SUPPOSS that you owned a gold mine. What would by you do with the gold? In the ordinary commercial lines the marketing of the product depends upon ability to place it before the people, and involves the menting of competition, adjustment of freight rates and the sormounting of numerous little difficulties, all of which have a bearing upon the ultimate result of your undertaking. With gold it is different. Uncle Sam standward to buy all of the gold brought to his mints or seasy offices.

sessey onces. \*\*

There are three coinage mints where you would be able to dispose of your buillou, viz., Philadelphia, Denver, and San Francisco. Should it happen that your mine was not located convenient to any of these

mints, you would find United States assay offices at Bodes, Idaho; Carson, Nevada; Charlotte, North Carolina; Deadwood, South Dakota; Helena, Montanai New Orleans, Loudsiana; New York city; Salt Lake, Utah; and Seattle, Washington. At these institutions gold builton is purchased and forwarded to the mints.

tutions gold buillon is purchased and forwarded to the nilnts.

You would take your gold into the office and watch it weighed upon a pair of balances so sensitive that although they had several hundred pounds in each pan, one one-hundredth of an onne would be indicated. Harof an ounce would be indicated. Having weighed your gold, the official would issue you a receipt for it which you would keep until you received your check or coin in payment. Your gold would then have become what is known in the office as a "deposit." This deposit, with many others like it. would be turned over to the melting department, where, in a specially con-structed furnace, it would be melted in a plumbago crucible with the proper fluxes and poured into a suitable mold. of gold is a very serious and difficult of goid is a very serious and difficult task. The high heat which it is necessary to generate in order to meit the metal necessitates a furnace constructthe most refractory material. These furnaces are usually operated by gas or oil and are built of the very finest grade of fire brick and fire clay. The plumbago crucible which is used is composed of graphite (the same material that comprises the center of your lead pencil), a little fire clay and little sand. In the manufacture of little sand. In the manufacture of these crucibles great care must be taken to secure a uniform mixture of the component parts, so that when heated no portion of the vessel will expand more than any other portion Unequal expansion would cause crack-

The crucibles are fashioned in molds and dried, or burned in kilns, after a

finishion similar to dishes or bricks. They are made in all slyes from those having the expectly of an after-dinner coffee cup to immense sizes holding over twelve gallons. Before multing gold in one of these crucibies it is necessary that it be very carefully annealed, which means that the last possible traces of molecure must be expelled by slowly increasing the temperature for several days. This is done by placing the crucibies in a stem-bested oven, where the process is carried forward until it is desued that the vessel is in suitable shape to be placed in the fire. Covers and stirrers are made of the same material as the crucible. The latter are used to stift the gold in the crucible after



Weighing the bars of bullion.

Selection of the select

Boring a bar for samples.

Removing samps from cupel

Removing gold assays from boiling apparatus.

HOW GOLD IS BOUGHT

annealing process as the crucibles, although it is not necessary to take so much care with them.

Gold coming direct from a mine is never pure. It may contain various base metals, the nature of which depends upon the process by which the gold was won from its nativity. Gold from stamp mills contains some fron, very likely some copper and often some quicksliver. From cyanific mills the builton nearly always contains sine, as this metal is made use of in the process. The zine, too, may also have contained inpurities, some of which will very likely be in the resulting builton. Copper has some of the characteristics of gold, both physical and chemical, so that if copper is contained in the original ore some of it will be very likely contained in the builton. Silver

nkely contained in the builton. Silver is always associated with gold in the ores of the latter. The amounts may vary greatly, but it may be stated that silver is always present in gold ores.

The problem of the melter who hanides the deposit at the assay office is did did set the deposit at the responsibility of the market from the deposit a har of buillion which will be homogeneous, or in the contract of t

Harting blaced the deposit in its crucible in the furnace, with the necessary duxes, the heat is applied and the metal and flux maried in thirty to forty-five minutes. The meltic puts on an immense pair of salestes mitts to protect his hands from the intense heat and removes the cover of the furnace, the cover of the furnace, the cover of the returble, and taking the sitrer in a pair of from tongs, he carchilly sitts the entire content of the crucible. The sitrere was placed in the furnace at the time the crucible and charge were admitted, and is of the same temperature as the

On very dirty or impure bars this other contents stirring may be done two or three times, futuace being closed in order that the heat brought up to the required point after stirring The molds into which the the gold arlous sizes is kept on hand so that no matter what the size of the deposit a bar will be turned out with a width approximately twice its depth and a length about twice the width. Into this receptacle the melter pours the contents of the crucible. The metal sinks the bottom, and the slag, as the flux is known after it has passed through the process, rises to the top.
After the metal and slap have solidified the mold is overturned, the sing separated from the bar, the bar clouded and weighed. In order that the depositor may receive pay for every bit of gold which properly belongs to him, the inside of the crucible is scraped clean and to min, the inside of the crucinle is exapted to see the slag treated by being crushed to powder and panned in a miner's gold pan. The problem of the melter, then, it will be seen, is to add the proper flux, to see then, it will be seen, is to and the proper nux, to see that the furnace produces the high heat which is necessar; in order to successfully melt the charge, to have his cruciales in such shape that they will not bronk in the furnace when subjected to the high heat and to dexterously pour the builton into the mold and

Trevover the values from the slag.

The weight of the granules which have been recovered from the slag is added to the weight of the bar and this amount is the weight of builton for which the depositor is plaid. It is then the assayer's business to determine the proportions of gold, silver and have metal in the bar. These proportions are reported in thousandths. He obtains a sample by means of a special clipping media charged for the purpose.

can emping memors treatment resources for evenestry to determine the fineness of this sample. It cannot be described in detail here. Suffeet it is asy that the precess is based upon the fact that from an alloy of god and silver in which silver predominates in the ratio of about three to one it is possible to dissolve the wint by airtie acid, leaving the pure solid helind. As we will silver which will be provided in a month of silver which will be facilities to the properties of silver which will bring the large large three to one, if it is eith in good or, if the is rich as viver, sufficient swelches due to the same proportion. This remains very merrly serven and seven tenths grains remains very merrly serven and seven tenths grains it is noticed any within a place of pure lead full weight ing about two grainness. An exact duplicate of this is made, as are also two similar samples from the opposite side of the bar. Two other samples are prepared of a welched amount of absolutely pure, or "precof" gold, and silver, culled the proof samples. A fourth set of samples is made from one thousand goldweight of the buillon, which is likewise incased in lead.

These samples are then placed in cupels, in a furmace which has been heated to a bright red. A cupel is a small dish, a little more than an inch in diameter, of boneash, and boneash is pulverized calcined animal bones. A cupel has the property of absorbing oxides of lead and other base metals when these oxides are formed during cupellation. What occurs in the furnace is practically this. The lead and other metals melt, and as the air passes over this molten mass the lead and base metals oxidize rather rapidly. A portion of these oxides are absorbed by the cupel and other portions pass off in the form of vapor. The final result of the process is a globule of gold and silver. The first three sets of samples (the top, bottom and proofs) which contain the proper proportion of gold and silver for parting, as the nitric acid treatment is known, are rolled out thin and placed in small cups of platinum platinum. These cups fit neatly into a basket of same material and the whole is then suspended in a platfarm cup containing botting attric acid which a platinum cup containing botting uttric acid which dissolves the silver, leaving pure gold in the cup. This is very carefully dried at a low heat, placed in the future to be momentarily heated to a cherry red, removing the last possible trace of mosture and weighted on the scales upon which the samples were originally prepared. This weight shows the amount of gold in the bullion, after making the necessary corof goan to the button, after maxing the necessary cor-rections tallested by the proof samples' gain or loss during the process. The fourth set of samples, which after empelation are globules composed of gold and stiver, the base metal having been driven off during the empelation, are welched without any further pre-liminaries. Their loss in weight indicates the amount of home works which was the building. Heart decise of base metal which was in the buillon. Having determined gold and base metal, the difference is reckoned

The scales used by the assayer in ble work are the most delicate of the appliances used in the assay office, although the large behaves upon which the deposits are weighted are themselves of extreme accuracy but the assayer's scales take the palso. They are send-tive to one two hundredthe milligramme. Fearing that will use the realized what this means it will be ex-

plained further. These scales will weigh a lead peacel mark. Some time when you are in the assay of depositing the hypothetical gold from the hypothetical mine, ask the assayer to weigh a piece of paper an inch square. After he has done this make a mark across this paper with a soft lead peacel and you will be surprised to see that it is possible to weigh the mark. It will weigh anywhere from one to three one bundredthe of a milligramma, depending upon the softness of the peacel and the breadth of the mark, of

The assayer having completed his work, reports the finences of the bar and the clerical force gets busy on the calculation of its value. Knowing the weight of the bar and the proportions of gold and silver it is a more matter of figures to arrive at its value. This done, you are given either a check or Vinted States coin upon surrendering the receipt which was given you when you deposted your bullion.

#### The International Carat Adopted by American Jewelers

BY the adoption of the international metric carat for weighing precious stones and gens the Ameri-can jewelry trade has taken an important step toward much needed uniformity and a single system of inter-national weights and measures. This action was taken at a meeting held in New York on October 29th, at which were present representatives of the largest American firms. The resolutions adopted provided for the use of the international carst after July 1st, 1913, and requested the Secretary of the Treasury to employ this standard in levying the duty on imported diamonds and other gems. The international carat is 200 milli-grammes or one fifth of a gramme (3.086 grains), and is now in use in France, Germany, and practically all countries except the United States, Great Britain Belgium and Holland, where various carats correspond ing approximately to 205 milligrammes are employed. It was established in response to a demand of dealers in precious stones in Germany in 1905, which was imtely supported by similar interests in France and other European countries. The carat, which originally was based on the weight of a seed, taking its name in fact from the Arabic word carob, meaning bean, never uniform or defined with scientific precision, and at the beginning of the twentieth century there were in use at least 20 different carats ranging from the Bologua carat of 188.5 milligrammes to the Arabian carst of 2546 milligrammes. Hitherto American jewelers have used a carat corresponding to 205.3 milli-grammes or approximately that of the British Board of Trade and of the jewelry trade of Antwerp, and of trade and of the jeweiry trade of Alliwers, and dealing as they do with merchants in many foreign centers of trade the diversity has often proved most annoying. With the international carat not only will this lack of uniformity be done away with, but it wil be possible to employ decimal sub-divisions instead of sixteenths, etc., and the actual weights for the balances can be made of the highest accuracy and referred to definite and legal standards. This action is quite in ine with the general tendency in metrological reforms and attempts at uniformity, where it is found that the most satisfactory progress now can be made by taking a customary unit and defining it in terms of the metric system.

### Inauguration of Emperor William Institutes By Our Berlin Correspondent

Two you're assentiate institutes founded on the initiative of the German Emperor have been recently inaugurated in the presence of the sovereign and a heilitant circle of scientists. These new headquarters of physical science, installed within the boundary of the former royal domain at Dablem, near Berlin, are destined to play an especially important part in the listory of German Science, being the first large German institutes to have been founded at least partly with the means contributed by private persons and on where the men of sciences will first have an opportunity

of giving themselves will include the an opposition of giving themselves of mixed to the control of the control

a name for himself by his recent symbosise,

mostac. In his address, the Emperor amounted his intention of the state of inviting the co-operation of the state science, searching for prophylactic misseness destined to protect the nen working underground against state cases trophes.

Dr. Harmack, president of the Respector Williams, Secciety, in his speech, amounteed the forthcoming fromtaltion in Rhemania, with tunds contributed by the city
of Millhelm, of an institute for coal researches. It
would be destroise, Dr. Harmack said, if every greatcity of the country in its turn founded an institute of
celentific research. A clinical radium testitune, declaried
to investigate the influence of radium emparities would,
by the way, be founded in the near future, and the
Emperor William Society also intended to promote
astronautics and aviation in their theorytical foundaitions. The society further saw one of the usein classic
into promotion of Mological investigation, for which
multitute of experimental therapsution and meditate
of the physics and hygiene of work, where the losefield or destruental influence of work on the human
organism and the preserving and increasing of its working capacities would be investigated. The society also
co-operates in the excavations of Samara and has
helped in organising an expedition for the fighting of
sleeping sickness in New Cameroon.

The funds of the Emperor William Society amount

The funds of the Emperor William Society amount to the total of \$3,200,000.

#### Luc Bink—A Plant that Produces Textile Fibers

ry HE use of the plant known as Luc Blink for producing textife sheer is the subject of a communication made by the French scientist, Perrot, to the Chamber of Commerce of Salgon, and his report on the subject is of interest from a commercial standpoint as being of a nature to develop the industry in Indo-China. The plant is of an aquatic variety to which the Annamites give the above name and its lotanical name is Rockorsés creasépes. What is remarkable about the plant is that it spreads very rapidity, so that within a short time it covers small pouds and even large lakes. It is said that a single stalk grows in a few mouths so as to cover a surface of 100 square yards. It appeared in Cambodga in 1902 and seems to have come from Java or the Philippines, or perhaps from Japan, and since that time its growth has been so remarkable that the authorities are becoming alarmed about it on account of the hindrance to navigation. They advise the natives to pull it up and burn it on the shore, and the Battanbang province has already devoted a good sum for this purpose. Me Perrot observed that the plant had strong fibers which could, no doubt, be used for textile purposes. After stripping the leaves, be put the stallar in a Duchenin machine so as to obtain the fibers, and after drying in the shade he found these to be in good condition and of supple nature. He was able to make repeated the stand of supple nature we have the same weight as jute sacks, but he found the interest of the indexing on he made of it so so to replece cane seating for chairs. A most practical use of the threads will be to use them instead of jute for making rices acks, and these are now used in great quantities in Indoclina. Using a Cambodgan loon he produced a strong and derible fabric, which was at least as stout as jute larging. With the same height and width, the sacks have the same weight as jute sacks, but he found that the weight could be reduced by treating the fibers with a chones alum bath, and this sets to tighten the fiber end close b

#### The Tehuantepec Railway

FIER Tehnantopec Railway, ovened in January, 1887, Australia of a strick in Weltowish; ranky each stripped its rival, the Panama Railway, and will presently nice be seriously affected by the opening of the Franama Chail. In the year could june 80th, 1911, the traffic over the Tehnantopec routs was nearly threshold that over the Tehnantopec routs was nearly threshold that over the Panama routs. The excellent instantial parts, Prierio Mexico and Salina Crus, are yielded by 20 sizemanish lines, besides the fiest of stanishm maintained by the Fablury.

was to the same of the same of

### Carrenpondence

ore are not responsible for state correspondence column. Anonymous tions cannot be considered, but the names endants will be withheld when so desired.]

sent Wreck on the N. Y., N. H. & H. R. R. at Westport, Com

To the Editor of the Schentific American:
The article published in your issue of October 26th,
1912, upon the recent wreak at Westport is so unfair 1912, upon the recent wreck at Westport is so unfair in the presentation of the case, and so faulty as to facts, as to demand an answer, and I assume that you would prefer that it be made in your own columns, and that you will not refuse space for this purpose.

chnical character of your journal confers upon cles greater weight than accorded those in the to arti sign-technical press, and the reputation of the New Haven Company with the traveling public should not have been assalled without first having exhausted all pave been assumed without met having exhausted all reasonable sources of information as to the accuracy of the published statements of facts.

The plain facts brought out in the course of the bearing held by the interstate Commerce Commission

made evident the unusual simplicity of the case, which was unclouded by controversies as to facts or by adverse

berumony.

A fast express train running at a speed between
fifty and sixty miles per hour traversed a No. 10 crossover between adjacent tracks and was wrecked. For
reasons which the unfortunate death of the engineer reasons which the unfortunate ocean of the engineer makes it forever impossible to explain, the time eard rule, requiring a reduction of speed to fifteen miles per hour on all "crossovers," was neglected. Without reducing speed, the engineer successively passed the distant signal 3,700 feet from the crossover, which was set at caution; a drawbridge, over which a maximum speed of 30 miles per hour was fixed by the rules; a worktrain conductor and signal towerman, who were both vainly trying to attract his attention; a section directly ahead on the same oring to "wave him down;" frantically endeavoring to reassony encesoring to "wave him down;" a home signal set at danger, and finally a "dwarf signal" per-mitting the use of the crossover only at speeds not exceeding 15 miles per hour, with the inevitable and disastrous consequences.

sastrous consequences. In short, the engineer "ran by his signals," an occurse which is lamentably frequent, and always most

The most searching inquiry failed to disclose any weakness of track, failure of signals or faulty train equipment. The experienced inspectors of the Intere Commission and of the Public Utilities Commission of Connecticut have inspected the track, signals and equipment, without suggesting a fault at the subsequent public hearing held in New York. In the previous article the New Haven Company

charged with the maintenance of un crossovers in its track, and general neglect in the con-duct of its operation. The article was written without previously ascertaining the conditions and character of previously seed raining like obtained and character or the crossovers on the New Haven road, and had the writer followed the accepted practice of reputable journals in previously submitting a proof to the reli-road company for criticism and comment, he would have been given a schedule showing the large number and unusually high proportion of long crossovers (No 15) already installed in the main line tracks between 16) already installed in the main line traces between Boston and New York, and would have been informed of the existing standing orders to replace all the shorter crossovers whenever practicable, and as rapidly as possible, following the previous accident at Burr Road.

This sapient critic, who doubtless derives his knowledge from some relative "in the railroad business," secures the use of your columns, and proceeds to draw sarre and alarming pictures of some unrecognizable rts of an engine, indulging in all the unruly gyrations parts of an engine, industing in all the unruly gyrations of an untamed Western bronce, and after showing just how the engine must have left the rails on the curve, indicates in his subjoined aketch that the derailment occurred, in fact, on the main line track, some 90 feet beyond the end of the crossover.

Attention is called to the pronounced "jog" in the oresover curve, which it is explained indicates cardess make the proposition of the property curve, which it is explained indicates cardess.

maintenance, but without explaining that the picture manusance, our authors explaining that the protect was taken ofter the week, still without commenting upon the surprisingly good condition of the track, which, while designed for train speeds of fitteen miles per hour, amost passed in askety a train at sixty miles per hour. How many cases has the writer seen in which was left in such good condition as in this

Bis cities the short crossovers of the New Haven road disperaging centrest to the long crossovers of the sunsylvania and New York Central companies, but Pennsylvania and New York Central companies, but says nothing of the presentage of long to short cross-overs in the tracks of any of these railroads, leaving ity to be intered that the New Haven Railroad is the jobs and suchaive depository of a special brand of short

MARIE SALES OF THE STATE OF

crossovers, not enjoyed in common by the other rail-roads of the United States. From his inner consciouses he evolves a new variety of crossover unknown to e railroad world, which, in his own words "can be made absolutely safe for the fastest speed at which seer can pull his train through them.

He asks if our witness does not "know that on that oad (P. R. R.) there are crossovers which are so easy in curvature and of such great length that the railroad has imposed no speed limit whatever upon the engineers in running over them," which would be humiliating had we not been previously informed by Mr. L. R. Zollin gineer of Maintenance of Way for the Pennsylvan Railroad Company, that the longest crossover on the Pennsylvania Railroad was No. 20, and that with one exception the maximum speed permitted by the rules of his company on all crossovers longer than No. is 35 miles per hour, and 15 miles per hour on all ot and had we not been informed by Mr.
A. T. Hardin, Assistant Vice-President of New York
Central & Hudson River Railroad Company, that a
maximum speed of 30 miles per hour was allowed by
his company on the maximum crossover (No. 18), and then only under special notices in time-tables, the speed on all other crossovers being limited to 10 miles per hour. Curiously enough, both of those gentlemen seem to be without access to the wealth of knowledge regarding their own lines so brilliantly displayed by our critic

our critic.

It is news to all signal engineers that an automatic train stop device has been perfected which will stop a train on a "clear route" set for a crossover, and it may possibly be news to our editorial critic that the Board of Train Control appointed by the Interstate Commerce Commission, with the aid of a Government appropriation, and after several years of experimenta-tion, failed to find a single automatic train control system which met their requirements, or which was specifically recommended for adoption by the board. It is contended that the existence of a longer cross-

over at the scene of the wreck would have averted the over at the scene or the energy owing have average and consequences of the engineer's disregard of orders and signals, which is possible, but not probable; but un-fortunately for the peace of mind of the railway manu-gers, no elew is afforded as to the particular kind of buffer or bag scoop devised to eatch trains which may pass the adverse signals at railway grade crossings, or open drawbridges, and which may leave the "derails" at speeds of 60 miles per hour or more. The wrecking train disregarding signals at a crossover should not be regarded as a crime in contrast to the intentional wrecking of a train at crossings and drawbridges, which is accepted good practice, and no essential distinction between the two cases is apparent.

Then follows the conclusion expressing the familiar and stereotyped hope for "early and drastic legislaand stereotyped nope for "early and drastic legisla-tion." There is every reason to believe that this hope will be realized, and past experience permits an accurate forecast of its form, which will be substantially as

Federal, State and Municipal Commissions will be multiplied, with extended powers, on which, under no circumstances, will the railways be granted representation, which will contain no member suspected of railway affiliations, nor any one possessing practical and specific knowledge of the subjects to be considered. The guilt of the railways will be assumed in advance,

and the burden of proof to the contrary will rest upon the said railways. The right of appeal will be denied, and the courts of appeal abolished. (N. B. To hell with the Constitution

The payment of dividends to its stockholders by any railway company within the period of ten (10) you next preceding the date of any suit or action for damag brought against it shall be considered oring face evidence of guilt on the part of the said railway company, and judgment entered accordingly.

degree of foreaght in the prevention of accidents quired of the railways, which will at least "hindsight" of the investigating board after will be required of equal the

It shall be the duty of the new and enlarged boards to require the installa quire the installation of all possible forms of new, ed, complicated or costly mechanical and electrical devices of a character adapted to provide against the most remote contingencies. Two or three million safe operations will not be allowed to excuse one failure, and if necessary to insure this degree of protection, the roadbeds must be festooned with mechanical gar-

lands, to even the exclusion of the sun's rays.

All track-ties must be replaced annually. Engineers will not be expected to regard signals, but nothing in the act shall be construed to relieve any railway com-pany from full responsibility for the acts, failures or as of its employees; strikes, riots, floods and acts of God to the contrary notwithstanding.

acts or God to the contrary notwinstanding.

No crossover shall be shorter than the longest cross-over in service on any adjacent railway, regardless of limiting local conditions, and all crossovers, sidings and industrial spurs diverging from switches in main tracks

shall be constructed in such manner as to permit the safe passage of trains "for the fastest speed at which

a engineer can pull his train through them."

A penalty not less than \$10,000 and not more than \$50,000 will be imposed for each and every "jog" in track, occurring as the result of a previous train week

The immediate and simultaneous replacement of all passenger equipment by steel cars to an amount not exceeding \$1,000,000,000 will be prescribed.

The special boards to be created or extended under the terms of the act will be prohibited from extending aid or assistance to the railways, tending toward the restoration of their lost control of operation, affecting the safety of the traveling public, nor will they be permitted to read the chapters on Preventable Accid by Mr James O. Fagan, in his "Confessions of a Rail-

The "human equation" shall not be investigated to the political determent of the party in power Adverse judgments must invariably be rendered against

the richest and most responsible corporation included within the field of inquiry, always excluding organiza tions and individuals having votes or slender resources

In compensation for any additional burdens that may be imposed under the terms of the act, the railways will be permitted to reduce their rates in the proportion of 10 per cent decrease in rates for each 20 per cent increase in the amount of the burdens so

Boards of investigation should conduct the examination of witnesses primarily for the benefit of the "vellow tion of witnesses primarily for the benefit of the "yearses," keeping in mind the secondary importance of developing the fundamental causes of train wrecks and means of prevention.

In the investigation of train wrecks by the boards,

no apparent lack of evidence unfavorable to the rail-way company should be accepted as conclusive. The public demands that an example should be made in such cases, and it is the plain intent of the law that such boards shall earn the salaries paid them by providing a victim under all circumstances

Railways will be required to employ complete duplicate staffs of operating officials in order to insure the safe conduct of operation during the absences of the regular staff in attendance at the hearings before the duly appointed boards, and all such officials will be expected to memorize all forms of statistical data, rates, car numbers, way bills, equipment lists, dates and details of contracts or other records for the convenient use

or contracts or other records for the convenient use and information of the examining board. The press will be injuned from publishing any oridence which may seem to favor the railways, and no technical journal shall be required to check the securacy of its statements in advance of publication. This forthcoming "drastic legislation" will certainly

be popular with the general public, and following previous precedents there can be no reasonable doubt of previous precedents there can be no reasonance onto to its passage. There only remains to be added the emeting clause and date to make the bill complete.

E. H. McHerny, Vire-President,
N. Y., N. H. & H. R. R. Co.

[Comment on the above letter will be found on our edutorial

#### Our Backwardness in Aviation

To the Editor of the SCIENTIFIC AMERICAN In answer to your editorial, "A Promise Unfulfilled," in the edition of September 21st, I suggest that the trouble is in the temperament of the people. They continually read of the aeroplane as being a great factor in war, and as it is scarcely ever heard of in any other nnection, they get the impression that it is of no us otherwise. As the American people are fast losing all warlike proclivities as being unnatural and inhuman, they turn from things so distasteful to their views of ason and justice Colorado City, Colo. A A. HANMMAN.

#### The Temperature of Bread Dough

To the Editor of the SCIENTIFIC AMERICAN Why not "do it in your head"? Multiple

Multiply Centigrade by 2, deduct (10 per cent) 1/10, and arbitrarily add 32.

The boiling point of Centigrade, 100 degrees, multiplied by 2, gives 200, deduct 1/10, 180, add 32, and you get boiling point 212 deg. Fahr Centigrade 10×2=20- 1/10-18+32-50 deg. Fahr

a very simple sum in mental arithmetic. Everybody may know the above, but if there are a few who do not, the above plan may help.

And while we are on temperatures, if a domestic scien tist wants to "set" her bread at a given temperature, say 80 deg. Fahr , she multiplies the sought-for temperature by 3, which gives 240 degrees Then adding the temperature of the kitchen, say 75 degrees, to the flour, say 65 degrees, we get 140 degrees, and deducting same from the first gross temperature, 240 degrees, we get 100 de-grees, which is the proper temperature for the added legads to make a dough at 80 deg. Fahr

Point Loma, Cal. CHARLES CRISTADORO

### The Mining of Herculaneum

#### A Splendid Opportunity for the Archeologist

By Professor Alfred Emerson, Art Institute of Chicago

AN American explorer of large experience and fine Aspirit, Dr. Charles Waldstein, has advocated a com-plete, final disinterment of Herculaneum, the buried Roman city at the foot of Mount Vesuvius, by international subscription. The Italian government has lent a favorable car to part of the Cambridge professor's proposal. It has decided to employ capable mining engineers on that enterprise, who will conduct it with pneumatic rock-cutters by electric light, instead of elbow-grease and torchlight. But it has rejected the co-operative feature. Short of cataclysms like the ski has christened the virgin soil of art history-to Asia Minor. Herculaneum will please stay dead! The mysterious underground city somehow refuses

to do this Its strange rediscovery is too closely interwoven with the rebirth of intelligence, and of modern

history itself. Let us see if this is not so.

The resurrection of Herculaneum and Pompeil in the eighteenth century took the imagination of all Europe captive. The dead occupants of the two Vesuvian ports conquered the modern heart. To be exact, all the new and near gilmpacs of classical antiquity that were

A long and singular oblivion overtook Herculan and Pompeti after their volcanic burial in the reign Titus, A.D. 79. The refugees from the nearer subtrobtained the freedom of Neapolis, the Graco-Rom Posterity forgot the buried towns, althou the Greek and Latin writers who relate th were easy of access and both places lay close to a bu highway. One stroke of the pick was enough to ray the secret of Pompel's underground survival. It old hilltop temple of Hercules and its tall amphitheats were, in fact, never buried as all its tall amphitheats were, in fact, never buried at all by the cloud of light



Beloch's plan. Reduction 0.28.

obliteration of antique shoreline by modern lava flow, the royal palace and pa underground sites, case dei papiri, theatrum, templum, basilica, baths (therms) and the recent excavations (scari nuces)



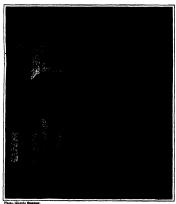
Model of Herculaneum theater on view at R THE MINING OF HERCULANEUM

thrown open toward 1750 and after worked together. Stuart surveyed the antiquities of Atheus Rome gave up a harvest of statues. A great Italian engraver portrayed the majestic rulus of the imperial city in a and noble etchings. "The glory that was Greece and the splendor that was Rome" penetrated philosophy, letters, the arts of design and even costume. Watteau's courtly gallants and powdered belles ceased This convulsion of Europe's taste fore shadowed the later social and political revolution. First Alfiert's "Brutus" and Chéuler's "Messenian Odes"; then Goddess Reason, the Consulate and the Prince d'Elbeuf discovered the remains of the buried Corsican Casar.

A clever Frenchman has described the beginnings of modern neo-Greek and neo-Roman art under the cap-tion "Empire Art Under Louis XV." He proclaims tion "Empire Art Under Louis XV." He preciains l'Irmesi its founder. Other tils stars in the new art firmament bear familiar names: Wedgwood and Flax-man, David and Percler. Canova and Thorvaldaea. The classical wave reached America. From Maine to Mesouri. Grecian portices still add dignity to the manse and majesty to the county magnate's mansion.

Ruggiero's plan of Herculan

nium walls, and Prince d'Elbeuf's open well mouti



sembled bronze horse from peak of theater.

pumice stone which fell on that section of the shore Farther west, a deluge of volcanic mud filled every cranny of the sister city. This blanket of wet volcanic cinders hardened to a stratum of solid rock, and is crossed only on top by lava streams of much later origin. The resultant condition is a sixty-five-foot stratum of very hard natural concrete and lava between the antique and the modern street levels, as against eighteen feet of loose, light gravel at Pompeli, with upper stories of submerged constructions outcropping. In spite of all this, Herculaneum was tapped first.

A princely foreign resident of Portici sank a well on his grounds, as we have seen. As luck would have it, his men penetrated through recent lavas to the heart of a lofty antique structure which was embellished with many statues of white marble. Prince d'Elbeuf extracted twenty columns of colored stone and ten or a dozen gracefully draped female figures from the ti ter and contiguous ruins. Some of these were after-ward identified as the daughters of Nonius Balbus, the builder of the municipal court-house. Elbeuf astutely presented three of his statues to Austria's popular mili-

sina earthquake, Italy prefers not to pass the hat. And Italy holds all the dice in the proposed arche-ological game. So far so good. Unfortunately, the problem has only been navigated back to the starting point. No sooner had the national government given a new twist to the conmitose underground exploration in 1908 and 1909, than litigation arose over the comatton of real estate holders in the modern cities of Portici and Resina, which crown the lava beds above Resina will not relent

Campanian town by accident in 1710, under his country seat at Portici The impending bleentenary of that event promises to be a sorry celebration, with nothing done to revive the torpid enterprise. Archeology will not languish on account of Mr Waldstein's disappointment. But Italy might cease to be its chief nursery herenfter. The world will give its better attention, as scholars are already Coing, to French Africa and Egypt, to the isles of Greece, and above all to that eastern half of the vast Roman empire which Strzygow

Twince Bingson. Austria ruled Naples at this . Its focal authorities, however, confiscated the fider of Eibest's nutrible harvest, and stopped his wing, without pursuing the work on government. The Eicebor of Saxony bought the Vianna so of Bugene's estate, and they are at Drasdon yet, early years later. Naples is a Spanish secundoture, and King Charles, who afterward beauties III. of Spain, is laying out a summer palace he site of Prince d'Eibest's old chateau. His archipopaed another well, or shaft, hoping to quarry opened another well, or shaft, hoping to quarry

10. 10.11

horses they found in position on that architectural eminence. Their royal master proved equally brilliant. Part of the crumpled brouse quadrigs was idiotically converted into bas relief portraits of the king and queen, and church furniture, although the heads of these brasen steeds surpassed those of San Marco at Venice! The bronze fragments were allowed to lie in a corner of the palace yard, a prey to passer-by, for many years, even after an able artist, who was summoned from Rome, had managed to rebuild one composite animal with the remains of all. All Nanles

the new shafts. Unpropued rock ceilings and walls fell in and endangered the modern town overhead. Alcuber's activity and petty beliousy were a burden to his abler Nwiss and Italian subordinates until his dath in 1780. But no trained expert was ever more fortunets in his digeting, and the king stood by him while the reparty old experim likel his palace with the spoils of Herculaneum. A Roman busilien or court-house 250 feet long, close to the theater, yleided some fine imperial portraits of the Augustam era, and two marble equiestrian nortraits of Herculaneum noblemen.



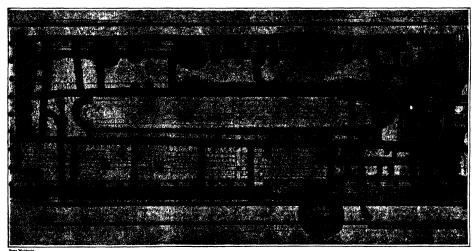
Metrodorus on the senses and Philodemus on signs, found in the villa of the Papyrus Rolls.



Marble Pallas Athena found in tablinum of villa, near 46 on plan. Greek style of about 490 B. C.



Wrestler or disk-thrower. One of a pair found at 74 and A on plan.



Outer peristyle or garden of the villa of the Papyrus Rolla. Capt. Alcubier's plan of his tunnels.

Note passage to inner peristyle at 46, Alcubier's main shaft at 2, 3, 4, 11, his redilled scoops at 48 to 70 Also, bronze statues in sites at 3, B, C, etc., and the 220-foot flatpond. Nearly all the statuary of the villa was recovered in this garden.

#### THE MINING OF HERCULANEUM

broken antique marble from it for the royal limekiln. Alcabler, the king's master of the works, was more as soldier than a sertwener. His Spanish darry of the sig is quaint reading. Naples, as Shakespeare would have called Charles, was very tucky. The diggers happened this time on the topmost pinnacle of the old Speater, with a big Latin inscription on it that identified the building as a public monument of the long-lost Respan town. But the king's incapable servants never quites made out whether it was four or six gill bronzes unto many the contract of the contract o

14, 7, 747

isughed at the curious medical attentions this brazen horse required. After every hard shower, the castle gates were closed for the king's steward to empty its belly with a bumb.

The same incompetence governed the tunneling operations. The royal excuvator bored only for artistic tressures of a portable nature, like statura; and freew paintings or messics. Little attention was given to the architectural relics or to the planning of buildings. Old shafts were choked up again with the rubbish of

A rectaugular temple yielded several Greek monochromes on marble and four big mythologies in fresco. In the fiftles Alcubier worm-holed a vast private

in the fitting Alcuber worm-noise a wast private mansion, a regular Boman palazo, with borisontal staffs. Comparetti and the Petra have almost proved, in a recent monograph on this building and its contents, that its first owner was one of the illustrious Pisones, and once the Boman governor of Thrace. Horace dedicated his "Art of Poetry" to this man's descendants,

(Continued on page 4ts.)

#### A Parachute Bomb for Aeronautic Use

Since airships and aeropianes have been added to the military equipment of nations, the want of bombs really sultable for launching from these aerial vessels has been keenly felt. The bombs that have hitherto been used for this purpose have one or more of the following defects:

When a bomb which is exploded by impact is



Assen's parachute bomb for sero-

thrown from a great height it acquires, in falling, a sufficient to bury it so deeply in the earth, before the explosion occurs, that its lateral action is annulied, because all of its projectics are discharged underground instead of scattering and carrying destruction in every direction over the earth's surface

bomb dropped from a moving airship has initially the horizontal velocity of the vessel, which may exceed 60 feet per second. Hence the bomb will not fall vertically on the object almed at, but will descend obliquely and strike the ground at a distance from its goal that cannot be calculated with accuracy. The effect of the explosion, furthermore, may be dim thished by two thirds, or more, by the obliquity of the axis at the moment of explosion.

3 The projectiles share the vertical velocity acquired by the bomb in falling from a great height and are therefore discharged, not horizontally, but obliquely downward into the earth. Hence the useful effect would be annulled even if defects 1 and 2 did

When the bomb is cleared for throwing, its safety catch or cap is released or removed. Under these condi-tions a misdirected throw or other accident may precipitate an explosion which would seriously injure en wreck the airship

In Assen's bomb these defects are remedied in the

10 August 8 noun these rejects are exacted 11 and following manner

1. The bomb has a very sensitive contact exploder which produces an explosion the instant its tip touches the softest ground, or even a water surface. Hence the bomb cannot penetrate the earth before exploding

The bomb is provided with a small parachute 2 The bomb is provided with a small paracranic which quickly destrost the horizontal velocity communicated by the air-ship. The bomb, therefore, falls vertically on the spot over which the air-ship is passing, and its axis remains vertical, so that the projectiles are discharged horizontally in all directions and constant. The arrange of the anatomic flow maximum flow of transform an area of the contraction. produce the maximum effect, throughout an area of more than 8 000 square feet
3. The parachate can be arranged to limit the

vertical velocity of the bomb to 100 or 200 feet per second, as may be desired. These velocities produce an appreciable effect on the paths of the protectiles, as the exploding mechanism is contrived to counteract their intinence

4. The exploding mechanism is so constructed that cannot act until the bomb has fallen 66 feet. Hence the bomb cannot explode in or near the airship

The bomb, when loaded and ready for use, weighs about 11 pounds and contains 400 projectiles, which have an effective radius of action of at least 50 to 100 feet from the point of discharge. The weight of the explosive charge is about one pound

These bombs are designed for use against detach

ments of infantry, cavalry and artillery. Very much larger explosive charges must obviously be employed for effective attack upon warships and fortifications. -Translated for the SCIENTIFIC AMERICAN from Kriegstechnische Zeitschrift.

### STATE Using a Frog's Lag as Whole

SATSPRESIDENCE PROGRESS

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By Our Berlin Core

C ALVANI'S well known experiment, which is apite, or rather because, of its being wrongly interpreted, are rise to the development of galvanic electricity, has become a familiar classroom demonstration, has become a fazzillar classroom demonstration, especially in lectures on physiology. A peculiar use has been recently made of the phenomenon by adapting it to the recording of electro-magnetic waves such as used in wireless telegraphy.

Dr. Lefeuvre, professor at the Medical High School of Rennes, has, in fact, devised the following arrange-ment for recording the contraction of a frog's muscle as produced by the passage of an electric stimulus ough a motive nerve:

The muscle M is solidly fixed in its upper part by seans of a pair of tongs, as shown in Fig. 1. The end of the sinew is connected by means of a wire to a light lever L pivoted at O. This lever is returned to its initial position, after the contraction is completed, by a weight suspended from it, and the end of the lever, which carries a fine point, bears ugainst a rotating smoked cylinder. At the very moment the muscle is excited through the intermediary of its nerve N, the contraction curve, enlarged by the lever, is recorded faithfully on the smoked cylinder. While many cold-blooded animals can be used for this experiment, the muscles of frogs' legs are particularly well adapted for the purpose, on account of the regularity of their form, the long duration of their excitability and the special case with which they can be severed from the

So far from severing the muscle completely from the ods of the animal, it is, however, preferable to leave it in position, cutting the "Achilles" sinew at its junction, and fixing it to the wire connecting with the lever. In this case, the central nervous system of the animal should, however, be destroyed, lest the experiment be disturbed by motive reflexes. The sciatic nerve is disacted over a short distance at the level of the thigh, and is lifted by means of the hooks of wire supplying the electrical stimulus

This neuro-muscular apparatus is so extremely sensi-

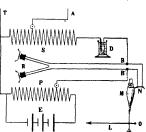


Fig. 1.-Diagram of the receiving station.



Fig. 2. the aid of a frog's log.

allowing the voltage in the reected, D an electrolytic de

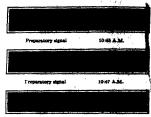


Fig. 3.—Eiffel time-signals re ded by the frog's i

high-resistance telephone receivers connected up in

To the terminals B, B' of these telephones ar nected, in shunt, two wires applying the electrical stimulus to the nerve N through the intermediary of small metal hooks. The excitation of the nerve is due to the self-induction currents produced in the coils of these

The tracings reproduced in Fig. 3 have been obtained nes by means of the arrangement above described and are records of the time signals given out daily from the radio-telegraphic station of the Elifted Tower. The distance between Paris and Rennes & about 185 miles. These signals comprise a preliminary signal calling the attention of the observer to a subsequent signal of very short duration which marks standard time. The time markings are sent out from the clock of the Paris Observatory, which is fitted with contact, actuating the transmission set of the Eiffel a contact, actuating the transmission set of the Effet Tower. They are sent every morning at 10:45, 10:47 and 10:49, respectively. The preliminary signals are different for each of these markings and can be expressed in the Morse alphabet. The tracings allow the preliminary as well as the time signals to be distinctly recognized, and when choosing a very fine style and only slightly smoked paper, they are seen in their upper part to show very fine indentations, the number of which corresponds to the rate of vibration of the transmitting apparatus.

This method of recording time signals is of remark-able accuracy. The time passing between the moment of excitation of a frog's muscle and the moment of its contraction is, in fact, extremely short. Moreover, this time—the latent period of contraction, as it is tims time—the satest period or contraction, as it is called—is a well known factor—in the present case about 0.01 second—for which due allowance can be made. As regards the delay due to the time taken by the wave in traversing the distance between Paris and Rennes, this is absolutely negligible, the rate of transmission of Herizian waves being practically the same as the velocity of light, viz., 186,330 miles per second.

While this arrangement is an interesting laboratory apparatus, it is hardly likely to become commercially practicable.

#### Horse-power and Kilowatt

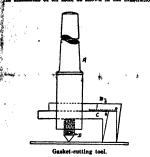
THE British Association for the Advancement of a Science adopted, as early as 1873, 246 watts as the equivalent of the British and American herse-power, and 736 watts as the equivalent of the metric or Condiand 100 watts as the equivalent of the factor of community horse-power, says Machinory. In a circular recently issued by the United States Bureau of Standards, it is stated that in all future publications of this bureau the former value, 740 watts, or 0.766 kilowats, will be used as the exact opulvalent of the English and American horse-power. For setsuific word, it will be used a quite important to have the horse-power thus standardized by being expressed in the so-called "absolute" avemeasurement, because the comme ten or messurement, occuse in control committee of 500 foot-pounds per second is exicutifically correst only at a certain intitude and altitude, on account of the fact that the pound-weight, as a unit of force, varies in whise as s, the acceleration of gravity, varies. In whise as s, the acceleration of gravity, varies in whise as s, the acceleration of gravity, varies to while the control of the control of

The second second

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## THE COLUMN

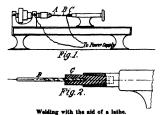
The appendications assent above a gazane cutter of dissipatement construction, which may be adjusted or only improved the stop, it manded of machine steel and tapered to suit the stop, it mande of machine steel and tapered to suit the stop, it made of machine steel and tapered to suit the stop, stiff the press spindle. The hody of the tool is slotted or spoulve a pair of outsizes, 2 and 0. These cutters are made of tool stool, and one of them is graduated as spinsons to of an inch, as shown in the literation.



This permits one to tell what size of gasket he is cutting. In the lower end of the body of the tool a sexterew D is threaded. This is adapted to bear qualinst the two cutters, holding them in position. The setscrew has a one eighth hole drilled through it, so that it may be tightened up with a pin. The outer end of the serve is turned to a 60-degree cone polar. In use, this point is sunk into the material, and the tool is revolved about the center, cutting out the gaslets. This tool will be found suitable for cutting gaskets from any material with the exception of metals.

### Welding Extensions on Small Drills By Nathan C. Johnson

ANECESRITY of very frequent occurrence in pracbatically every workshop is the lengthening of the shank of a small twist drill. This is particularly true of the amateur shop; and when the necessity arises of drilling a hole deeper than the length of the shank on the standard twist drill, the problem of welding on an extension is one of serious aspect. Indeed, it may be said that a weld of this kind, particularly if the drill be under \$J\text{this} of an inch, is a very difficult matter, even for a skilled blacksmith, as it is almost impossible to beat the shank of the drill at welding heat without spolling the steel, or drawing the temper in the rest of the drill at the very least.



With the object of overcoming these difficulties, the following simple method of making the weld was derised. It will be seen at a glance-from the drawings that the means used was the electric current, but it was impracticable to use a current heavy sough to heat the drill, owing to its gastesance, so the heat of the electric are was suppliesely.

the electric are was employed.

To hold the drill and the extension rod in line and
also to regulate the are, a small bench inthe was
pleased into service. Figure Fig. 1; it will be seen that
the extension rod. 4 is held in the chuck on the headstick. To this latter is also uttanhed one tearminal
of the electric circuit. In the tall slock is fitted a
play of hand robbier, of the rob, papered a too end to fit
this skillench; and having a socket at the other of such
a lighe such hold the drill is to be lengthened. This
religion, or fiber, piece holding the drill is to insulate
the state that of the state of the resultation of the formadirection.

BACK ASSAULT TO THE

Let will now be seen that it we turn the handwheel on the hall stock as as to bring the extension rod and the drill into contact, we will complete the electric electric. If them we unscrew the tailstock a little, we shall draw out an are between the two pieces. It takes but a few seconds to have the two pieces at a meiting heat; and if the are is looked at through bue glasses, it will be easy to determine when this condition has been attained. When the metal is seen to be molten at the extreme tips of the drill and the rod respective to two butts together; and after cooling off, it will be found that a most excellent wide between the two has been preduced, the electric weld having the added advantage over common welds that it is most sound at the center, with imperfections on the outside, while the reverse is true with blacksmith welds. All that is necessary now is to remove the terminals from the pieces and dress the weld off with a fine lite.

Drills down to the very finest can be easily and accurately welded to extendants of any length by this means. There is no roughness to the weld; it is strong; and because of the use of the lathe, not only is the arc under perfect control, but the resulting drill it is nearly a lignment as new determined well in the resulting drill it is nearly a lignment as new determined.

as the arc union per perfect control, but the resulting drill is in perfect alignment—a most designable quality. As a source of current, an attachment to an electric light socket has been used for the fluer sizes. For larger sizes, it may be necessary to re-fluer the resector from which the drop is taken; but even for large drills, up to 1/4 inch, 2 amperes at 110 volts is amply sufficient

#### Workshop Notes

Method of Removing Broken Screws.—In order to get out broken screws, bolks, and short stude, which were not long enough to be gripped with pinchers, gas pliers, or jam-nuts, the writer has successfully used a mut (employing various sizes for various serves) cut through from one side with a hacksaw to form a split nut. The split nut was screwed on the serve as far as possible, then it was gripped in a pair of pinchers or gas pliers, in cases of light work or in a clamp or hand vise for heavier work. The nut in turn gripped the screw so that it was easily unnerword. Such a nut may also be used to hold short round- or flat-beaded screws or setseress while they are out to desirable lengths with hacksaw or thick, which operation is very botterswine, especially if the screw is so short that the part that is to be taken off desered.

Near-rating Treatment for Tools.—All ron tools, such as squares, wrenches, plurs, dividers, serow dravers, etc., have the unwelcome property of rusting. In damp shops the tendency is even more marked. For all such cases as arise with plain iron tools (those not plated or painted) the following treatment will be found to be an efficient preventive measure. Obtain some potassium bichromate (five or ten cents worth will be sufficient for a gallon of solution) and some sodium hydroxide (iye.) The water used as a solvent should be dutilled and warm or hot if possible. To a gallon of solution) and some sodium hydroxide (iye.) The water used as a solvent should be dutilled and a sam or hot if possible. To a gallon of solution) and after it is alsolved and dut be bichromate. Make the solution saturated, i. e., put in as much of the bichromate as will disactly a solution should be sturred. Now clean the tools, utensis, solve. Since the orystals do not disactly very fast, the solution should be sturred. Now clean the tools, utensis, paper or clut with a ret to be treated. They should be smoothed and polished if possible. Sandpaper or emery paper or clut will be found eserviceable for this purpose. Then submerge the tools in the solution. When several process are treated at the same time they should not touch or interface with one another. The treatment should least a long as possible. This may be for one, two, or more days, or even for several weeks. The tools may be taken to the solution and the an ended and then reinserted in the solution and timely as not clear to reclean them Some tools, as serwe drivers, squares, dividers, etc., can be left in the solution and timely. If the solution evaporates, it can be replaced. Ordinary tools can be washed and wiped with a cloth after treatment without descroying the more value of the solution or an ended. This method will knop them they be about the shop, and since it does not injure the non-crusting effect. This treatment thould be very valuable about the shop, and since it do

of the theory will be dispensed with. The potassium bishromate and the lye can be obtained at any drug store and should be handled with care, since both are poisoous, and one causes burns while the other causes unsightly flesh stams under the condition of moisture on the flesh.—Philip Edelman.

### How to Remove Chatter Marks By William Grotzinger

A SIMPLE method of remoting the charter marks that an angle, so that its broad edge will keep from failing into the old charter marks. In the accompanying illustration let the lines AB represent the cutting edge of the tool that produces the chattered effect. The charter marks will them be parallel to the edge of the tool to



Angle of tool for removing chatter marks.

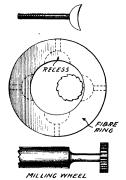
By grinding the tool so that its cutting edge lies in the direction CD, the chattered work may readily be removed. This method will be found especially good in turning fromwork

### Improvised Milling Machine

By Louis H. Tolhurst

A SHORT time ago, I found it necessary to replace the filter in the timer of my automobile. It consisted of a filter ring about 3½ inches in diameter, about ¾, of an inch thick, and about ¾ of an inch wide. This ring I turned up in the usual way on my small foot-power lathe from an ordinary block of red filter. When I had done this, I found I necessary to cut four hair dredes on the inside of the ring, at even distances apart, and about 3/16 of an inch wide, and corresponding in shape to the four steel electrodes which I had removed from the old timer filter, so that those electrodes could be set in the limer side of the ring, capssing their flat surface flush with the inside surface of the ring.

To accomplish this, I clamped a large cap screw in the chuck and turned the head down to such size and thickness as would exactly iff the cut desired to be made in the ring, turning the shank down to 5/16 of an inch at the same time, as shown in the illustration



How the lathe was used as a milling machine.

With a built round file, I can teeth on the wheel, as shown, being carried to keep the edges of the teeth even with the circumference of the wheel, in this way quickly making an untempered utiliting wheel the exact size deadred to do the work. This took built an hour, no hardening being necessary. This rest enough, By mounting this little milling wheel in the chuck of the laths, and clamping the fiber ring with an ordinary wood clamp to the side of a bar of steel mounted in the tool rest of the laths, the work was done in twenty abundance some, thus using the laths as a milling maminutes more, thus using the laths as a milling maminutes more, thus using the laths as a milling ma-

I leave it to the imagination of the reader as to the length of time it would have taken to cut these recesses at all accurately with a cold-chiest. I have taken used this little home-made mill to graval advantage on wood, hard rubbler, bubbler, bubbler, bush up remarkably well; but if the same were made of tool steel and hardened, of course it would serve for a much greater range of uses.

### Inventions New and Interesting

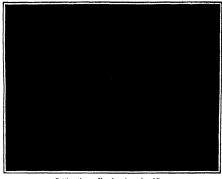
Simple Patent Law: Patent Office News: Notes on Trademarks

#### Profile Gage

W HEN a carpenter or cabinet maker wishes to fit a piece of board against a molding, or any other irregular against a monant, or any other frequent surface, he is apt to find his task a diffi-cult one, unless he happens to have a full-size, cross-sectional drawing of the moiding. In order to provide a ready means of producing a profile of the molding, an inventor has designed the gage shown in the accompanying illustration. shown in the accompanying influences in it consists of two plates of pressed steel fastened together with screws to form the body of the gage. Between the plates a series of wires or thin rofs are changed with just enough pressure to camped with just choose pressure at various points of adjustment. To facilitate the gripping action of the two plates, their edges are corrugated so as to fit about each rod. The manner in which this gage is used is clearly illustrated. It is m necessary to press the gage down upon the molding, moving each rod down with the fingers as far as it will go against When the gage is removed the molding the ends of the rods will form a perfe profile of the molding, and this may be transferred to a board by laying the gage down and drawing a pencil along the pro-The wire rods are each one twentieth of an inch in diameter and every tenth rod is of brass, while the rest are The brass rods thus divide the gage into half inches, which facilitates measuring an object. Thus the width of the molding can be determined by the vare without the use of caliners

#### Imitating Cloth Samples With Embossed Paper

one who is not directly connected N one who is no uncervast sum of money is spent each year by large drygoods dealers in making up samples of their various lines of goods It is not unusual for a large house to spend twenty thousand dollars on samples for a single line. And frequently over a hundred thousand dollars represents the annual sample bill of a single til we understand that large numbers of sumple cards must be made up, that yards and yards of material, often very expensive, must be cut into small pieces and be pasted on the cards by hand. These sample cards must go out to drygoods stores all over the country. There are one hundred and eighty thousand of them in the United States, and of these twenty-seven ness, conceived the idea of reproducing thousand are department stores. Of the samples by making embossed impres thousand are department stores. On the samples of maning emosses impres-course, the enormous expense of getting sions on the card. He devised a method out a line of sample cards for a compiler of reproducing the textile fabric so ac-line of goods renders it impossible to sup-curately that one can actually count the line of goods renders it impossible to sup-pit all these stores with a set of cards threads on the embossed paper reproduce ent patterns he can select by referring to ference between the roadside device and



Getting the profile of a piece of molding.

sary to start up tion by using an ordinary counting glass the mill just to make samples. There are Any slight irregularity in the cloth is other difficulties. Frequently mistakes are faithfully reproduced. Even the alightly other difficulties. Frequently mistakes are faithfully reproduced. Even the slightly made in pasting the wrong samples on the frayed edges are there. He has shown cards opposite the printed numbers. This this work to expert drygoods men, and will result in the delivery of the wrong has completely deceived them into thinkpiece of goods, and may involve consider- ing that actual pieces of cloth were pasted Recently, an inventor who has had con- samples in separate cards, he makes up a



Sample card with embossed printing in perfect imitation of cloth samples

siderable experience in the drygoods busi- | complete line in a long folder, something ness, and also in the lithographing busi-ness, conceived the idea of reproducing

like that of a railroad time table. A por-tion of one of these folders is shown in the accompanying engraving On the first page is a piece of the actual material which the buyer may examine critically to test the quality of the line. The differ-

the samples. As an evidence of the ne only colored samples of cloth are repro duced, but even white goods. Ever, thread is there and the height of the em bossing equals the thickness of the thread.

The paper sample card has been adopted by a number of large merchants in New York city, who find that it cuts down their sample bill fully 50 per cent. They do not have to wait for the material from the mills before making up their samples, but can have them reproduced from the design, and they no longer stand in dread of a mistake on the part of the paster. Furthermore, they can have enough cards printed to furnish every drygoods store in the country if they so

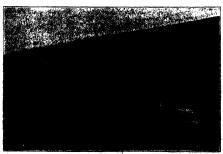
#### Improved Mail Exchanging Device

many accidents have occurred in So many account fast moving trains, and there have been so many fail-ures to catch the mail sacks from the roadside crane, that the Post Office De-partment a few years ago advertised for inventions that would overcome the diffi-culties. There were many responses to this invitation from the Government, and two or three of the inventions have already received the approval of the Post Office Department. Among them is the one shown in the accompanying illustration. The device was tried out for a full year on the Illinois Central Railroad and was found to give perfectly satisfactory

Attached to the train is a metal frame of rectangular form which forms the mouth of a bag made up of chains. This crane is hinged at one side to a pair of across the mail-car door, and it can oved to either side of the door, depending upon the direction of travel of the train; the lower outer corner of the hinged crane is connected by a rod to an extension of the lower cross-bar and bears against a heavy spiral spring. The mall crane at the side of the track has a single arm instead of two as heretofore, and from this two or more mail bugs may be suspended. As the train nears the mail trane the iron frame is swung out to catch the mail bag. The shock is taken up by the chains and by the coil spring referred The recoil of this spring throws the device back to the car door with the mail sack in the exchange bag and the mail clerk can then readily draw it out without reaching outside the car door. At the roadside a similar crane and chain bag is supported in proper position to receive the mail bags that are suspended from the lower bar of the mail car as



The train is about to deliver three sacks and receive two.



Positions of the mechanisms after an exchange of mail.

carried on the train, is that the is larger and much more subital. During the operation of the on the Illinois Central Rail ries have varied from a single ntaining a handful of letters sacks and a pouch of 810 pounds in get. Single pouches practically empty es been caught and also pouches filled that they could not be strapped the middle, as is necessary with the istyle of hook. All conditions have an met with trains running from three four miles an hour up to sixty miles without damage to a single piec n hour mail.

16, 1915

At some of the stations where heratore it has been the practice to make de veries ten or twelve hundred feet away spread, and the device has been located between them directly in front of the depot and under the eye of the station

#### Adjudicated Patents

A MONG the recently adjudicated pat-ents reported in the Patent Office Offi-cial Gazette, are the Wilfley patent, No. 590,675, for an ore concentrator which was held valid and infringed in Mine & Smelter Supply Company v. Brackel Concentrator Company; the Claude and Hess patent, No. 664,383, for an apparatus for st and distributing acetylene gas, limit to term by the British patent, No. 29,750 of 1896, granted to the same patentees, which expired by limitation June 30th, which expired by limitation June 30th, 1910; also held not infringed in Com-mercial Acetylene Company v. Searchlight Gas Company; the Lutz patent, No. 839,-071, for a machine for heating surfaces, held invalid: also not infringed if conceded alidity in Equitable Asphalt Maintenance Company v. Parker-Washington Company the Hood patent, No. 858,070, for a burial crypt, held void because the subject-matis not within the patent law. International Mausoleum Company v. the Spahr and Stichler patent, No. 948,-773, for a gas iron, claims 2 and 7 held valid and infringed; Strause Gas Iron Company v. Weil; the Hamilton reissue patent, No. 12,750 (original 619,567), for a face plate for burial caskets, held void in National Casket Company v. Stolts; the Seeley reissue patent, No. 12,757, for an ncandescent la mp socket, held valid and infringed and in Bryant Electric Company v. David Killoch Company, and the Smith reissue patent, No. 13,033 (original No. 759,037), for a lamp, held void as not for the same invention disclosed in the orig patent; also held not infringed if valid, Smith Incandescent Light Company v. sch Gaslight Company.

#### Competition for Miners' Lamps

THE use of portable acetylene lamps has become general in a large number of mines, and this illuminant has definitely replaced the old lamps, oil or otherwise, anks to its cheann es and the excellent light given by it, and the number of acetylene miners' lamps at present in use can be counted by the hundred thousand. Nevertheless, in spite of various models revertedess, in spite of various models employed, it does not seem that any of them completely realise all the conditions which a good miners' lamp should fulfill; it is, perhaps, on this account that this application of acetylene is not so universal application or acceptence is not so universal at might be. The carbide factorise have therefore decided that here they had to find a perfect article, and they have just established an International Competition to this effect, of which the following are aditions:

Under the auspices of the acetylene unions of the different countries, a com-petition for acetylene lamps for mines not petition for acetylene lamps for mines not containing free-damp is opened from now under the care of the International Com-mittee of Carbide of Caleium, at Geneva. The prise or prises shall be awarded to the lamp or lamps which meet completely ful-fill the following conditions: simplicity and regularity; cheapness; strength and light-

The state of the

nes; easiness of upkeep; convenience in deaning and refilling; difficult to upset; easily handled, and capable of being carried samp nanded, and especie or being carried in the hand or being hung on the walls; solid material, light, durable, and unaffect-ed by dampness or the results of the de-composition of the carbide; strong burner of long duration and placed or arranged so as to avoid extinction from dripping water or by mine violences; production of gas as constant as possible; rational generation from the point of view of purity of the gas as well as the yield of the carbide: utiliza tion of the present sizes of carbide; in-tensity of 5-10 candle-power as far as posdble; duration of charge as long as pos The competition shall be divided into two categories: (1) portable lamp for carrying by hand, duration of charge 8 to 12 hours; (2) portable lamps for car-rying on the forehead, of extreme lightness and a duration of at least 4 to 5 hours At the discretion of the jury, either one or two prizes may be awarded, of a tota of 5,000 francs, which may be granted, if two prizes are awarded, as to 3,000 france for the best portable lamps for the hand and as to 2,000 frames for the best portable lamps for the forehead. The models, with description, price of re-sale, etc., must be forwarded before March 20th, 1913, to the International Committee of Carbide of Calcium, 5 Rue des Granges, Geneva The jury will be composed of competent ates from the different countrie nated by the respective acetylene unions.

#### Prizes for Electric Mine Lamps

THE British Home Office has published the report of the judges in the compe tition promoted last year by the gift of \$5,000 by a colliery proprietor, which had for its object the encouragement of the production of safe and efficient types of electric lamps for mines. The judges, Charles Rhodes, a former president of the Mining Engineers' Institute, and Charles Merz member of the recent departmental committee on the use of electricity in mines. had submitted to them one hundred and nmety-five lamps, and have awarded the first prize of \$3,000 to the C. E. A. G. lamp, sent in by F. Farrer, Dortmund, Germany. Inasmuch as a number of other lamps possess considerable merits, the amount offered for competition has been divided into the first prize of \$3,000 and eight prizes of \$250 each. In an early issue we will publish in the Inventor's Department a brief illustrated article on the prize winner's lamp.

#### Notes for Inventors

Novel Cup or Hole Rim for Gold Links. -This cup or hole rim, patented, No. 1,041,081, to Howard Hinckley of Washington, D. C., has a cup section and a lower anchor section, one of the sections having a threaded stem and the other helically disposed lugs which form a mutilated thread and by adjusting the connection, the cup may be located properly with respect to the anchor section.

A Drinking Bowl for Horses, -Richard Markley of Norristown, Pa., has obtained a patent, No. 1,042,246, for a druking bowl for animals in which there is a bowlshaped body portion and a nozzle projecting upwardly within the bowl and shaped o be taken into the mouth by an anim the nozzle having a passage through which water passes from the supply and the sides of the bowl project above the top of the

Two New Edison Patents,-Thomas A. Edison has secured a patent, No. 1,041,756, for a conveyer in which there are upper and lower runs of a belt and means which receive the material discharged from the upper run and direct it forwardly upon the lower run in the direction of travel the lower run in the direction of travel of the latter at substantially the same speed as that of the best. Mr. Edison has also secured a patent, No. 1,041,083, for a phonograph stylus, this patent being assigned to Thomas A. Edison, incorporated. The invention in this

is formed of crystallized boron with rounded point adapted to travel in the groove of the sound record.

Wanted, a Close-fitting Glass Doc Knob.-Crystal door knobs of out or other glass continue to grow in favor. A cor-respondent calls attention to an objection to this form of mounting in that the con-nection of the glass with the metal seems in present forms to involve a greater pro-jection from the surface of the door than the metal or similar commercial knobs, and suggests the possibility of so conne suggests the possibility of all controlling the glass with the metal as to enable the fitting of the crystal knobs as near to the door surface as others. This may necessitate changing the form of the knob itself the method of connection w the metal, but the thoughtful inventor should have no serious difficulty in pro-ducing a knob free of the objections above

Touring Accompanies .- Now that autonobiles have so advanced that they make extended tours more and more desirable ater attention will be given to the at tachments and equipment in the way of facilities for camping out over night, as well as along the culinary line. One has only to consider the sleeping accommodation of the ordinary gypsy wagon to realize the opportunities of even a small car. It ved that one could devise a simp form of folding cot adapted to be supported upon the front and rear seat backs. problem would doubtless be more in the neans for anchoring the cots in place than in the folding features for close storage, but, possibly, the inventor may combine the For cooking en route, chafing dishes and other forms of alcohol stoves are convenient, and kits with facilities for using gasoline, the fuel at hand, may find favor

Operator Alarm Circuit from Vanit Lining.--John P. Williams and Herman Huhn of New York city, assignors to Electric Bank Protection Company, have patented, No. 1.041.395, an electrothermo static lining for vaults, safes, etc., in which the spaced thermostatic conducting plates in layer with lining members operate when subjected to heat, to a an alarm, in an alarm orcuit which in-cludes the spaced layer plates.

Electricity Utilized in Cotton Harvester. A San Francisco man, Willie Robert McComb, has patented an improvement in harvesting cotton by which the cotton on the plant is charged with electricity to cause it to expand and a current of electrifled air is utilized to remove and harves the cotton when it has been thus expanded The patent claims the process and also the harvester in which the process is utilized in the field. The patent is No. 1,041,650

Muffler for Motor Boat Engines.-Robert Sheldon Strahan of Brooklyn N. Y., has patented, No. 1,041,190, a muffler for motor boat engines which muffler is in the form of a funnel-shaped chamber attached to the end exhaust pipe of the engine with the oper end of the chamber to rest slightly below the surface of the water, so that a partial vacuum will be formed in the chamber.

An Elihu Thomson Arc Lamp.—In patent No. 1,041,197 to the General Electric Company, as assignee of Elihu Thomson of Swampscott, Mass., is shown an electric arc lamp in which the lever for operating the arc establishing clutch is actuated by an electro-magnet and means are provided for damping the action of the lectro-magnet for reinforcing the bite of the clutch by and in accordance with the action of the electro-magnet.

A New Multi-stage Elastic Fluid Turbine.-The General Electric Company, as assignee of Louis C. Loewenstein of Lynn Mass., and Leonard H. Dyer of Greenwer run in the direction of travel latter at substantially the same vish, from he seems of the best. Mr. Edison of coscured a pasetant, No. 10-41 (1963), 10-41-121, for a multi-stage elastic fluid oscured a patent, No. 10-41 (1963), 10-41-121, for a multi-stage elastic fluid oscured to Thomas A. Edison, north-side which has a furnase within its hold for rebeating elastic fluid between the target and being incoated activate for the string reason being located eleven the stages and being independent a cityle for talking machines which of

#### Legal Notes

Assignment Before Issuance of Patent Conveys Only an Equitable Title.—An asignment before the issue of a patent of the entire interest in an invention conveys only an equitable title, and the holder of such an assignment, even though it be duly recorded in the Patent Office, cannot revoke the power of attorney given by th inventor in his application Following old decision by Chief Justice Tancy, Following an Patent Office has repeatedly sustained this view, holding in one case that where two instruments are recorded in the Patent Office, both of which purport to assign the invention disclosed in an application and only one contains a request that the patent issue to the assignce, the Patent Office, under the authorities, should recognize only the right to prosecute the case of that assignee to whom it is requested that the patent usue, and this to the exclusion of the other assignee The practice is founded upon the principle that prior to the issue of the patent the inventor has an imperfect and inchoate right which he may perfect and make absolute by having letters patent issued to him, and an assignment, including a request for the issue of the patent accordingly, passes the legal title to the assignee, because under it the assignee has, as the inventor had by law, the right to secure letters in his own name.

"Tabloid" a Proprietary Trade-mark.--According to the Oxford English Dictionary, edited by Sir James A H Murray at the Clarendon Press, Oxford, volume 1x, published October 1st, 1910, was registered as a trade-mark on March 14th, 1884, in England by Mesers Bur-roughs Wellcome & Co. for chemical subroughs wencome & Co. for enemical substances used in medicine and pharmacy, and afterward for other goods. The Court of Appeal in England held the term to be 'fancy word" as applied to the go ingly restricted the use of the term to the preparations of the firm named. "Tab-loid" is also a valid trade-mark in this sountry for similar preparations made by the firm

#### Trade-mark Notes

Proof of Infringement.-In the case of Gorham Manufacturing Company v Schmidt et al., the District Court S D New York, by Justice Hazel, has held that proof of sales by defendants as dealers of articles bearing infringements of complainants' trade-marks, although to agents of complainants only, together with proof that defendants had other similar articles displayed for sale in their store, is sufficient to entitle complainants to an injunction and that dealers are obliged to be on their guard when buying from manufacturers and to a certain extent are put upon inquiry as to the character of the manufactured product and the manner in which it is labeled or impressed as well as the pack-ages in which it is contained, in order to protect the trade-mark rights of other manufacturers in the same business

Names of Ex-Presidents not Registrable as Trade-marks.—The present Commus-sioner of Patents refused some years ago to register the name of ex-President Grove leveland as a trade-mark for eigars upon the ground that to use the name of ex-Presidents as trade-marks tends to detract from the high office which they have held and for that reason it was believed to be against public policy for the Patent Office to encourage such use of the names by allowing them to be registered as trademarks.

Insufficient Use of Trade-mark. In the trade-mark opposition case of Patterson v Hay, it appeared that the only use by Hay of the mark for a liquid binding agent for roads, etc., had been upon a small number of gallon cans of the solution which were shipped as samples. Commissioner Moore held that this use was not such that any trade-mark right could be based upon it and sustained the decision of the Examiner of Interferences in favor of the opposition by Patterson to the application for registration filed by Hav

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors Terms on application to the advertising Department of the SCHEMZIFIC VARMICIAN

Perializing to Apparel.

GARMENT FORM—E. T PLAMESSEED, 710 RORMENT FORM—E. T PLAMESSEED, 710 RORMENT FORMER PROVIDES AND THE IMPORTMENT PROVIDES AND THE SECOND TO SECOND THE SE

#### Pertaining to Aviation

Pertaining to Aviation.

LIPE RANNIN GAMEENT POR AVIATORS.

J J Courann, care of Mone C G Oblitas, ingenium 100 Rue Adel Monen, Alexandria, Ezrytt This Invention provides a garment adapted for aviators, to prevent lajury or control care of the control of the co

Of General Interest,
CO MILIND INTELLABLACIAN AND
SURWINDHIVER II AMER, 414 E 187th
K, Ilman, N Y, N Y, The object here is
to provide a combined cyclass-case and screwdriver, of which the case is adapted to carry
cyclasses in the usual manner, and the driver
is mounted on the case to permit convenient
removal thereof for repairing the cyclasses
in the control of the control of

NON-METALLIC BEARING.--C. O. L. CAR-

an construction DEALINI.—C. O. L. Carbial. Iven' I Block N. X. This invention provides a bearing pulley bushing and like articles, formed of wood and not rorated that the
filter are hardened, and the wood is permeated
with a special inbulenut and preserved. to
render the article exceedingly serviceable for
accountant colling can be dispensed with.
PIANO IIAMMERI—J. W. E. LAKEN, BOX.
105, Victoria, Intitle victoria, Canada. This
invention relates to hammers for planes and
other stringed instruments, and more particularly to the saket or joint connecting the head
to provide a joint or socket, whereby a new
head may be readily applied to the shank of
the hammer without Interfering with the rest
of the mechanism



the finger is positioned, the parts being mov-sible relatively to each other and being adapted to be held in such removed position whereby movement of the finger or straightening ther-of is prevented. The engraving herewith shows

prespective view of the device in operative scalino on the fadex flages.

LOCK POR MASCULE BRIDGES.—H. C. Kaasa, 1728 Spalding Ave., Chicago, III. The main object here is to provide a devise its which the strains are taken up by the leck person of the counteredshift tightly against the bumpling block as as to prevent any movement of the counteredshift tightly against the bumpling block as as to prevent any movement of the strain of the counteredshift tightly against the bumpling block as as to prevent any movement of the strain of the counterpart of the coun

Hardware and Tools.
COIN-CONTROLLED LOCK.—D. W. Woo,
care of McNutt & Shattuck, 12 Knight Block,
Ilrail, Ind. Mr, Woods invention relates
to a coin-controlled lock, and more particuwhich a charge is made. It provides a lock in
which the coin will remain in view after
the door is unlocked and will remain in this
position until the door is opened from the
ladde.

COMBINED SEAT DRESSER AND CUT-TER HOLDER.—W. KARER, 155 So. Main St., Wilkes lister, Pa. This tool provides for always having a plurality of cutters with the dressing-tion, which may be readily attached to the properties of the properties of the short of the properties of the pro-tained of the properties of the pro-tained of the properties of the pro-tained of the protained of the pro-tained of the pro-tained of the pro-tained of the protained of the pro-tained of the pro-tained of the pro-tained of the pro-tained of the pro-ta

definite result.

DODE CHECK.—E. W CLARK, 617 2d Ave., Routh, 81 Petersburg, Fla The intention bere in to provide a simple and inexpensive construction and arrangement of parts whereby to provide a door check which will be efficient in use and possesse strength and durability, and its which the treation may be readily required.

lated RHOR JACK —F. MELLEN, North St., between Union Piace and Wyckoff Are, Brooklyn Illis, New York, N. Y. This investor's aim is to compensate for the wear on the sole during the period of wearing the shoe. An olject also is to restore the resiliency, elasticity, strength and stiffening to the soles under the instey, and to afford an improved resting place for the leaf of the foot.

or the ball of the foot.

IIO.DNB POR INKWHILS.—C. KHOKE,

III W. 3d Ht., Reardstown, III. This invention
provides means to hold an intwell now comnonly used in school desks, and to so position
the well as to bring its top bloow the surface
of the desk top, thereby preventing the spilling and appressing of ink on the top of the
dresk. An important feature of the invention
is the part the holder plays in affording protertion to books and papers. In case say ink
is restanted in the bottom of the holder and
cannot pass to the receptacle or drawer below.

INNECT THAIP.—C. Hongardan.

cannot pass to the receptacle or drawer below.
INRECT THAT —C. Hongarham, Oswego.
Ore The principal object here is to provide a trap having a meanium holding capacity, simplicity of construction, and arranged for use of mentipulation. The insects are captured by being drawn by the bait in the trap, to enter through the slots at the bottom of the trap From the bottom disk they crawled.



successive wire disks. Somewhere in their clim prior to reaching the topmost disk where most of the batt is deposited the insects are over come and die. The engraving inserted here with shows a vertical section of the trap. with shows a vertical section of the trap. DOOR CHECK AND HOLDER.—H. A. GETAFSON, care of J V. Addis, Namorf P. O., Illowa Hiver, Fill Jislands. This improvement is in uncans for retaining in an open or particular to the property of the control o

DOOR OR WINDOW LOOK.—W. J. Daimmer,
101 Walner St., Sew Sort, S. X. She seeded.
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101 Walner St., Sew Sort, S. X. She seeded.
102 Walner St. She seed to the seed of the country of the seed of the country of the seed for locking a dever or what down shut whom the same is not furnished with regulate locks, and an oelect new in to great the seed of the seed of

#### Machines and Mechanical B

Machines and Mechanical Buvices,
APPARATUS FOR MAKING TOOTHED
GRAING—F. HUMFMIR, BATTOS FOWER,
Bacticky, Bagland. The present inwards relices more particularly for possentia success or
the property of the present invasion relices more particularly for possentia guarantees
authorized the property of the property of the pronature surfaces of the helmet-shaped tooth and
correspondently shaped recessor or boles constituting the generated elements in the wellknown "Rumphers" type of genting in U.
TOOTHED GRAING—F. HUMFMIR application Serial No. 467,134.
TOOTHED GRAING—F. HUMFMIR inventor
tool related to separation for producing the
operative surfaces of the se-called "generated"
wherein the operative surface of a motion
transmitting element in one member is produced by the generative action of a rectar quiter having an effective profile which reprement in the other member of the gearing. It
relates more particularly to the apparatus
in U. S. Faton No. 855,662 and U. R. possing
application Serial No. 467,154.
APPARATUS FOR MAKING CONFETT.

application Serial November and U. B. pedding Application Serial November 2000 Application Application of the Serial November 2000 Application Application of the Serial November 2000 Application App

theoreto.

ARREMBILING MACHINE.—GRORDE A. Enston, care of Defiance Machine Works, Defance, Ohlo. This assembling machine is more
especially designed for assembling the secstatomobiles and other whiles, the machine
being arranged to insure an accurace and
quick assembling of the wheel parts with a
risw to form a true wheel and to provide
the wheel parts with a false or a temporary
the wheel parts with a false or a temporary
is placed on the rim.

SCRAPER ATTACHEMENT,—G. E. TOCKER.

is placed on the rim.

BCRAFER ATTACHMENT.—G. E. TUCKER,
Springwater, N. Y. The invention relates to road grading machines, and particularly to attachments for scrapers and an object is to provide a structure which will permit the scraper to readily pass over obstructions with-out injury to the machine or the scraper.

out folury to the sacchine or the scraper.

CUT OFF YOB BOX COUTRING MA.

CHINBS.—a. BRIL, 108 Beach Mt. Jersey
CLY, N. J. The improvement is in cut offs for box covering machines or the like, and the purposes is no provide a structure whereby the cutting knife will automatically disengage itself and when worn may be adjusted for presenting a substantially own cutting surface.

REDUCING VAIVE.—S. A. Struson, 751
Ammerdam Avo. New Tork, N. T. The more wide a valve having a great variety of uses and being of simple structure and also being expandition as well as in high, low or varying pressure.

quantities as well as in high, low or varying pressure.

AUTOMATIC WATER LIFF.—G. A. France-son and A. Massiall, Condon, Ore. The in-vantion pertains recently to devices for life ing water and more particularly it involves in the control of the control of the control any suitable vessel community in the control of cisters whereby atmospheric pressure may force water from the well or cisters into a vassel.

vessel.

LINE CARRIER—L. D. SHAFFER. Segfe
Level, Pa. This invention is an improvement
in line carriers, such as shown in Mr. Shaffers
price patent, and like the construction shown
in said price patent, in especially intended for
use in stringing wires after the fact wire has
been strung, as we'll as for carrying the wires,
lines, etc., across an intervening agace having
a wire for supporting the device.

Frime Movers and Their Accessories, FLOW MOTOR—O. C. MOORM, Morrow Ohto This device supplies feel to a stem generator in proportion to the water supplies to said generator, and is what is connected to said generator, and is what is connected to said generator, and is what is connected to the connection with the invention discloses in Mr. Moore's application for a feed water and feel control.

INTERNAL COMBUSTION ENGINE...A. F. Cautanous, 364 8th Ave., Grand Rapids, Mick, Tale angine has a pair of oppositely disputed

SLIDING DOOR LOCK. itt. Albany, N. X. For the purp invention use is made of a tract on the car, hangers fastpaced to the or provided with hooks engaging the lars journaled on the hangers and travel on the track, and manually wedges adapted to be formed between lors and the track to firstly compan-lors and the track to firstly compan-tory of the control of the control open, closed or partly open position of the control of the control of the control open, closed or partly open position.

lors and the track to firstly engage the bithest books with the track and thes took the done books with the track and the shock the done books with the track and the shock and shock and

PROCE Whereby the spreading of the smale, use to intental procusion, may be prevented.

METALIC WHERLS—S. H. SCHWERSALLE STATES AND STATES AN

DRBION FOR A HANDLE.—T. F. CURLEY, S18 Hroadway, N. Y., N. Y. This ornamental design is of a stropping handle for any made of safety ranor blade. The concave place or thumb seat and the back of the handle are made so as to get the right angle to strop a blade correctly,

a blade correctly.

DEBION FOR A BANNEH.—A. B. VAN EIPS. core of Prost & Van Eiper. Paternoa. Vesage, the control of the contr

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historicary and the daily weakler into harmony. "On
Dr. Shaw it conformed as the counter of his work
by great difficulties due to double standards of
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forecasting The physical processes involved in weather phenomena are given a careful examination. Subsequent chapters present special phase of him work of forecasting—sales and soon-warn-forecasts for accounts. Recent development in practice, as put forth by such authorities as Exholm and Guillert, received use attention, and there is a chapter on statistical methods for long-period and essential forecasts.

THE UNITED STATES PATENT OFFICE By E. C. Moore, Commissioner of the United States Patent Office. Reprinted from Vol. IV, 1911, of the transactions of the American Institute of Chemical Engineers.

Chemical Engineers.

Although this paper was intended primarily for chemical engineers, it contains matter, that should be of interest to every inventor manufacturer, and actentific man who comes into contact with the Patent Direct directly or incontact with the Patent Direct directly or incontact with the Patent Direct directly pointed out the needs of the Patent Office, and made a strong plets for the use of the militions already collected from inventors for the improvements of the patent service ANTEROPLOGY. By R. R. Martet, M. A. New York Benzy Holtz & Co., 1912.

In the Patent Patent Strong Strong Strong Direct No. 1912. In the Patent Strong Strong Direct No. 1912. In the Patent Strong Strong Direct No. 1912. In the Patent Strong Direct No

mail, 56 conts.

Frof. Marwitz definition of anthropology is
"the whole history of man as fired and pervased
by the idea of evolution." The race problem as
stated, the influence of environment traced,
chapter, and energy on pools organization, law,
religion, and morality lead up to as epilogistic
study of man as an individual. The book is
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by Frod T. Jane With a Special
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tempted. The sold and nearly of the mixing industry, which should be followed by those who enter top which should be followed by those who enter top which should be followed by those who enter top which should be followed by those who enter top the following of the following of

STRENGTH OF MATERIALS. A Text-book for Secondary Technical Schools. By Mans-field Marriman. New York: John Wiley & Sons, 1912. 12mo.; 169 pp.; illus-trated. Price, \$1 net.

travacd. Price, \$1 net.

Students in the higher classes of manual training schools have been kept particularly in mind in the preparation of this work, and the leasmes are so presented as to dispense with the calculus, and to require only a knowledge of arithmetic comparation of the work of the contract of the contra

CARADA. By A. G. Bradley. New York: Henry Holt & Co., 1912. 16mo.; 256 pp. Price, 50 cents net; by mail, 56 cents.



Once upon a time there dwelt on the banks of the holy river Ganges a great sage, by name

Vishnu-sarman.

When King Sudarsana appealed to the wise men to instruct his wayward sons, Vishnu-sarman undertook the task, teaching the princes by means of fables and proverbs

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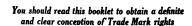
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#### The Mining of Herculaneum (Concluded from page 181.)

who continued, no doubt, to make the villa at Heroulaneum their summer home. They nursed literary ambitions. Their estor, Lucius Calpurnius Piso Cesoninus, seems to have been no better or worse than the average grafting Roman governor in partibus. One conceives him as a mild rival of the notorious Verres, who left no marvel of art in all Sicily unlooted while governor of that island, according to Cicero's account of him. It is charitable to suppose that Piso wa atisfied to purchase the art treasur the collection of manuscripts which he conveyed to his Herculanean villa, on the way home from his foreign service, prob-ably at Athens. Several of his bronzes have Greek inscriptions on them, and one of them, which is a copy of the famous Spearman of Polykieitos by a late Athenian statuary, bears the latter's Greek signa-ture, Apollonios, the son of Archica. Only two per cent of the 800 manuscripts disgovered in the Villa of the Pisones are Govered in the villa of the Pisones are Latin, all the others are Greek. It is from these that the antique mansion takes its best name, The Villa of the Papyrus

The Pisones, if indeed they owned this The Pisones, if indeed they owned this private gallery of sculpture, and library, possessed many fine portraits of Greek literary and other heroes, both in marble and bronze. There is a marble one of the tragic poet Euripides. The Pisone were playwrights themselves. Alexande the Great on horseback, and again, perhaps on foot, is the subject of two exquisit bronze portrait statuettes. The Pisos had two bronze busts of Demosthenes. The inscribed one has served to identify all the extant portraits of that eloqu patriot, from the famous Vatican st down. It adorned the library of the Herculanean house, together with several othe inscribed bustlets of the leading Epicurean philosophers Another portra energy, was named Piso by Comparetti. Others called it Seneca. It is the head most likely, of some late Greek poet. Still another bronze, which was formerly called Plato, is evidently a bearded Bacchi

The decipherment of the charred papyrus rolls themselves has revealed the pre-dilection of their first purchaser for the doctrines and writings of one philosophical sect, the Epicurean. To tell the plain sect, the Epicurean. To tell the plain truth, Piso's library is a horrible disap-pointment. Instead of lining his pigeonholes with great literature, on the pattern of President Eliot's five-foot shelf, this retired statesman read contemporary philosophy. His favorite authors might have been half a hundred lost Greek poets. They prove to have been the sort of people we used to call divines! The resurrection of Lord Byron's theological bookshelf in the year 2500 would scarcely provoke many shouts of joy. Witness the lines he wrote himself.

Mines no wrote himsel.

"Much English I cannot pretend to speak,
Loarning that lasguage chiefly from its
preaches.

Barrow, Nouth, Sillotson, whom every week
Barrow, Nouth, Sillotson, whom every week
I study, also Blair, the highest reachers
of eloquence in poetry or prose.

I hate your poets, so read none of those."

Still, there are fragments of a speech by Hypereides, the man who procured the beautiful Phryne's acquittal by unveiling her charms to an Athenian jury, and an essay by Epicurus, and a readable treatise on music by a certain Philodemos.

The labor and the risk of opening these fragile rolls is incredible. I saw a trained reader undo one under glass at Naples Two silk ribbons held a film of collodion in process of formation. Sections of the in process of formation. Sections of the charred writing were persuaded to athere to this light foundation, as a clockwork slowly, slowly unwound the moistaned volume. The reader must copy the sur-viving syllables as bost he can, from his black on black model. The desigherment and the publication

The decipherment and the publication of the Herculanean texts, of the Volumina Herculaneania, which were issued under the imprint of the Herculanean Academy by Neapolitan scholars of the eighteenth by Neapolitan scholars of the eighte and early nineteenth centuries, eng

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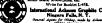


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more attention than the exploration of the ruins did, especially after King Charles exchanged the crown of Naples for that of Spain in 1759—the rock was so hard Moreover, Pompeii was Herculaneum's triumph ant competitor from 1748 on, when it also was discovered and identified. The Bonaparte kings of Naples, Joseph and Joachim, did much for Pompeii. Not so the Bourbon rulers, who at one time employed only "fifteen asses and fifteen children" on the ruins, when they had no royal visitor to impress. Herculaneum relapsed into a second semi-Heroulaneum relapsed into a second semi-oblivion, from which it was dubiously rescued by Victor Emmanuel the Second's assignment of two thousand dollars a vess sasignment of two thousand dollars a year to the new scari d'Ercolano from his privy purse. In Campania, three thousand dol-lars clears about one buried dwelling house a year. But none of the lately explored buildings has rivaled the basilica of the buildings has rivated the besilics of the Balbi and the great theater, or even the Villa of the Pisones. They have not located even the principal street of the old city. It is only fair to add that the mode of clearage and conservation which Fiorelli, the great reformer of the Pompeian enterprise in the seventies, intropeam enterprise in the soventies, introduced at Herculaneum also, is infinitely superior to the wild rummaging of the d'Elbeufs and Alcubiers. The "new ruins" are partly exposed and partly tunneled shafts.

Some day, perhaps, when curiosity ceas to lash modern explorers to dig more than they can properly digest and preserve, there will be a second resurrection and transfiguration of underground Hercula-neum and of its hyperthral sister town. Of one amphitheater and three theat already recovered, one structure, surely, could be put in condition for entertaining pageants. The house of the Roman consul could be presentably renovated with Sabatino de Angelis's excellent fac-similes of its own bronze statues and graceful candelabra, plus duplicates of its transported fresco paintings and mosaic floors.

The decorative significance and the artistic charm of these things was certainly far greater in situ than it is in the Naples Museum. And the tourist who cheerfully pays his half dollar at the gate turnstiles, is no irredeemable barbarian if he craves more Cleero and less Dante than he gets now, at the end of his melancholy pilgrim-age to the Gulf cities.

Pompeli, in its weatherbeaten barenes resembles nothing so much as the path of an unrecent conflagration. To visit Herculaneum is to visit a mine. A blotch of bright sunlight still fleeks the serried seats of its Greek theater through Prince d'Elbeut's historic hole. The bronze horses vere found on that piece of masonry. These sixteen descending and concave benches were part of the cavea, for which the flower were part of the caves, for which the flower of the local population held twoyr tickets on show days. Still farther down, you cross five conentrie ledges of more ac-centuated coneavity. Upon these the magistrates and the priestly colleges, the bullet-headed duumviri and portly de-curriones, the sleek augustles and purse-proud knights, Roman knights, joutled their cushioned chairs, if the play chanced to be a Greek tragedly. For in that case the chorus sang and performed its evolu-tions in the orchestrs. When the play was a comody or a masque or a burlesque, was a comedy or a masque or a burlesque was a contest or a masque or a nursesque, there were orchestra chairs. But the highbrows of the period rarely got their favorite Ibsens. The play was more often a medley of music and morals, of pas dedeux and mass alignments interspersed deux and mass augmments inverspersed with sentimental dialogue, such as we too have acquired a faculty of enduring. "The Pleasures of the Enchanted Island." What have security fleatures of the Knohanted Island. What think you of that? Trie Louis Quatorae, is in not Ofton, too, the people demanded an inexpensive but ridioulous farce of Hariequin and Pantaloon, learned doctor and greedy Brighella; for this is the Osoan country where that form of farce to bright and is popular still. What had its birth and is popular still. flea bites have we not weathered it, from Naples to Calabria! ered to learn

This supposed platform, which looks like a series of holes in a tunnel floor, was the stage, so the guide says, and we marvel This supposed platform, which looks like a series of holes in a tunnel floor, was the series of series of



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was by going to the other end of it with his shrinking toroidisme. It is one third wider across than Le Soale's stage at Milan it, and was backed with a niched and statued wall representing a conven-tional palace front, as the surveys of Le Vega and the plastic model in the Resina Museum show. For little is visible of all Museum show. For little is visible of all this. The back vall was often, size, hung with painted drop sonnes, and was finaled with painted drop sonnes, and was finaled with painted side sonner; mommed on triangular prisms that were easy to switch for changes. And over the opin top of the house, sailors doubties stretched great sembroidered awrings to alack the spectators, as we know they did at Rome and Pomposil. Pompeii.

Two ivery play tickets have been found in the buried playhouses. One of them specifies seat or tier 12 in the Æschylus section. Campania evidently followed the section. Campania evidently followed the example of Athens, where statuse of the classic dramatists adorred the some of their triumphs, and gave namies to asstions of the theater. One likes to think that Roman theaters encouraged many minor social pleasures besides gratifying literary taste. I doubt not that many a Hereulanean lover tested the precept of O'd'd frivdous "Art of Love" on the stone benches we are now treading. You must contrive to meet your sweetheart at the circus, says the good poet. None comes contrive to meet your sweetheart at the circus, says the good poet. None comes between you there. Does her clock ally to the floor? You must dive for it. Does the dust settle on her dress? You hasten to dust it off. If none settles, you dust that. Presently she will allow you to fan her, and to dilate on the events in pro-

It is time we ceased to eavesdrop upon Ovid's Roman lovers. The uniformed guide shows us out again. It is up, up, over one hundred stone steps from orche tra pavement to the fresh night air on the streets of Portici; for it has fallen dark streets of Portion; for it has fallen dark while we were below. It is too late now to visit the park of the royal villa La Favorita, so we drive three miles on the rattling lava pavement flags of Resina and Torre del Greco to our quarters at the Hotel du Vésure. No time to dress. A hasty brush-down and a change of neckwear must serve. Alse for America's diagrace! They have dressed the dining room in the national colors and vardure for our special humiliation, and in honor, apparently, of Director Giuseppe Spinaz-zola's recent promotion to the archin-spectorship of antiquities and excavations throughout southern Italy. Dr. Spinazzola, who is here from Paestum, is provokingly modest and reticent. What more has be modest and retreent. What more has ne found there? A new Greek temple, or an army of statues? "There is still better news; but you must wait for the champagne." The explorer's eyes confirm his

extravagant promise with a merry twinkle.

At last the butler launches a battery of At last the butter laumches a battery of Asti spumante greade marque on the bouse, and the glad scoret is betrayed. Parliament has voted one million frances for the exploration of Eroolano (applause). The King of Italy has been pleased to sign this appropriation, and to grant a further allowance of one hundred thousand dollars for the same service, from his per-sonal resources. This credit is good for three years of operations on an imposing scale. Hereulaneum will live again. It is scale. Herculaneum will live again. It pleasant to be reminded, by an Italia voice, that it was conceived, matured and brought to the present promise of spiendid fruition by the admirable courage, skill and dogged perseverance of one American scholar, Dr. Charles Waldstein.

#### Night Storm Signals

A SPECIAL commission of the International Meteorological Committee, which A Monal Meteorological Committee, water met in London in June, 1909, proposed a set of storm signals for use throughout the world. This comprised combinations of cone-shaped symbols for use by day, and of red and white lanterns for use by and of red and white lanteres for use by night. The daytime portion of the code was accepted at the last meeting of the international Committee, Red at Section in 1950, but hes not yet been just in cities office in all countries (a. i., die Chillian glains, Walcher Barnet, Mill and Marie with). The proposed in the last of the with).



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It consisted of the following combinations of lights, in a vertical line: Two red, for a gale commencing with the wind in northwest quadrant; two white, for a te, for a gale commencing with wind in the southwest quadrant; red above white, for a gale commencing with wind in the northeast quadrant; white above red, for a gale commencing with wind in the southeast quadrant; three lanterns, red-white-red for a hurricane.

The meteorological service of France urged that these simple combinations would be liable to confusion with other harbor lights, and advocated a set of three-lantern combinations, in a vertical taree-intern combinations, in a vertical row. The German service favored a tri-angular arrangement of lights. Various other schemes were suggested. An en-larged commission on maritime weather signals met in London in September, 1912 and after prolonged discussion decided that it would be impracticable to secure universal agreement on a single code of night signals, but that the meteorological ervices of the world-with whom final decision in the matter rests—could prob-ably be induced to agree that any com-bination of lamps forming a storm signal shall have the same significance in what-As a majority of the great maritime countries of the world were represented at the London meeting, the ultimate effect of this conclusion may probably be forecast thus: All countri will use vertical combinations of red and white lanterns to warn mariners by night of the imminence of storms and indicate the direction of the wind therein. (The proposal to display lights in a triangular arrangement has been abandoned.) Countries will have the choice of two codes. One of these will consist of combinations of two lanterns; vis., the code described above, as proposed at the meeting of 1909, except that the hurricane signal will be abandoned, and in its place a single red light will be used to indicate an atmospheric disturbance, without information as to the direction of the wind. The other will consist of combinations of three lan erns, and will include a hurricane signs Lastly, a country may elect to use but a single lantern for night signals; viz. a red light replacing all the day signals. A further suggestion under considera-tion is to use a green flag or a green lamp

to indicate that no warning can be hoisted on account of telegraphic communication being interrupted, as is now done at Thorshavn, Farce Islands.

#### Do Crystals Conduct Heat?

PROF. R. W. CLARK of the Minera-logical Laboratory, University of Michigan, has for several years been exof heat in crystals. The apparatus used in the tests consists of a stage for sup-porting the crystal, so arranged that a spring presses it up against the contact point of the conducting instrument. This instrument is placed at right angles, and may be heated by a flame. The unsatis-factory results were due to the radiation of the heat. To overcome this, a plate of ome mineral, such as gypsum, is dippe in parafine until a thin even coat is formed on one side. The plate is then placed on the stage of the instrument with the waxed surfuce down. Strips of asbestos insulate the under edges. The point of the conducting wire reads in a depression in the upper unwaxed surface. In this way when the heat is conducted along the wire to the crystal, it must actually be transmitted through the crystal of gyptransmitted through the crystal of gyp-sum before it can melt the parafine. A very sharply defined ellipse will be noted in the parafine, and this is clearly due to differences in conductivity of the crystals in different directions and not to

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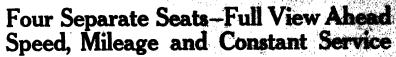
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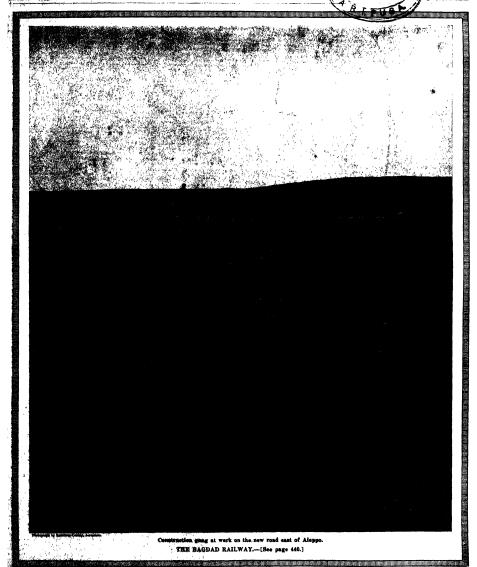
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The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### The Sherman Anti-Trust Act and the Patentee

N April 16th, 1912, Mr. Oldfield, Chairman of the House Committee on Patents, introduced a bill, the purpose of which was to revise and amend the laws relating to patents. Twenty-six public hearings for the taking of testimony, occupying alto gether fifty-two hours, were held by the Sub-Committee of the House Committee on Patents to discuss the merits and demerits of the bill. Manufacturers of patented articles from almost every city in the union, as well as prominent inventors and prominent patent attorneys testified before the committee The discusvas limited to those clauses that provide for what have become known as the "compulsory license" and enforcement of liceuse restrictions" provisions Out of sixty persons whose testimony or communications are reported in the hearings, only six favored these provisions. On August 8th, 1912, on the eve of these provisions. On August 8th, 1912, on the eve of adjournment of the House, the original Oldfield bill vas reported back with amendments in the nature of a substitute, and with the recommendation that the substitute be passed. Congress, however, took no ac tion upon this recommendation before adjournment. It is not unlikely, however, that when Congress recon-venes, the substitute bill will be reintroduced and an effort made to mass it. For that reason it is a matter

enter matter to pass it. For that reason it is a matter of considerable importance to study its provisions. The substitute Oldfield Bill provides, in phraseology, somewhat different from that of the original bill, for compulsory licenses and non-enforcement of license restrictions, essentially like the corresponding provisions of the original bill. It extends the application of compulsor; licenses to an earlier date in the life of the pate and exempts "original inventors" under certain condi-tions from compulsory licenses. In addition, the substitute bill contains a number of provisions extending the application of the Sherman Anti-Trust Act, wher ever patents are involved, to specific transactions that are not now covered by the Sherman Anti-Trust Act, and which, if no patents were involved would, under the existing law, or even under the substitute Old-field Bill (if passed) lie outside the prohibition of the Sherman Anti-Trust Act. This extension of the Sherman Anti-Trust Act, by which specific transactions, now lawful, would become two factor violations of the Sherman Anti-Trust Act in case they involved patents, but would remain lawful in case they did not involve latents. involve patents, was not present in the original bill.

It was not discussed or suggested by anyone upon the hearings and was not foreshadowed by any patent legis-lation previously proposed in either branch of Con-

The scheme for the extension of the Sherman Anti-Trust Act resembles that of the proposed amendments to the Sherman Anti-Trust Act introduced earlier in the seedon by Senator La Foliette and Representative Lenroot, except that their proposed amendments to the Sherman Anti-Trust Act ayewedly applied to all articles of commerce, patented as well as unpatented.
The Oldfield substitute bill, however, by excluding from its provisions all the transactions in patented arteles and limiting its applicated discrimination discriminations. against patented acticles and grouply in favor of on-

atented articles. And mandor of any patented article at tempts to restrict the grice at which that article no be sold, he violates the Gliffield extension of the Sh be sold, he violates the Oddfield extension of the filter-man Anti-Trust Act. So, top, if he attempts for evertria a customer from burjing or using an article obtained from somebody else, whether such attempts be made by agreement against the purchase, or by, a cqudition of mile against fife purchase, or by a restriction upon the use of the patented article sold, or by making in the price of the patented article any discrimination sed upon whether the customer buys the article from mebody else, the Oldfield Bill is violated. If the vendor of any patented article, with a view to pre-venting competition with that article, acquires any other patent or license, he again infringes the pronci-When the vendor of any patented artic aw. men tae resource or any peternet article, with a view to restraining competition, makes in the price of the patented article any discrimination (other than the ordinary wholesale discount) based upon whether the customer buys from him goods of a particular quantity or agargate price, he is to be punished as the Oldfield law prescribes. He is forbidden from attempting to restrain competition, either by refusing to supply somebody or by consenting to supply anybody only upon terms or conditions less favorable than are accorded to anybody else. He may not attempt to restrain competition by supplying to somehody in any particular territory patented articles upon terms or conditions more favorable than are accorded to other customers. Nor may he attempt to restrain competition by making any arrangement under which he shall not sell his patented article to cortain clue sons or to those doing business in certain territories.

No one who deals in any natented article may do business under any name other than his own or that of his firm or corporation; no one may "misrepresent" the ownership or control of his business, or of the identity of the producer or vendor of any patented article sold. The vendor of any patented article mus article sold. The vendor of any patented article must not attempt to prevent competition, by supplying the article at a price at or below the cost of production and distribution. He must not secure information con-cerning his competitors', business through bribery of an employee of his competitor or of any Government official or by any illegal meens. He may not fix an unreasonably high price upon some material not sub-ject to a patent, which he controls and which is re-quired for producing a competitive article. He must lot attenut to restrain competition by two of save not attempt to restrain competition by use of any

unfair or oppressive means of competition.

Whenever a combination, in violation of the Sherman Anti-Trust Act, is shown to control any patented article, "reasonably required" in manufacture, producarticle, reasonary required in manufacture, produc-tion, general consumption or use, and "no adequate op-portunity exists to immediately substitute another arti-cle therefor of real utility" the court shall compel the owners to supply the patented article until some other adequate substitute can be provided, upon ment of either "a reasonable compensation to be d by the court" or an amount of compensation payable according to any valid contracts then existing.

Final judgment in a civil proceeding that a defendant
has violated the Sherman Auti-Trust Act by the use of any patent in any manner prohibited by the act sh constitute, as against that defendant, conclusive evidence of the facts and as to the same issues of law in favor of any other party in any other proceeding indence of the party in any other provening and other provening the Sherman Anti-Trust Act. Whenever a defendant has been adjudged in a civil proceeding to have violated the Sherman Anti-Trust Act. by the use of any patent in any mainer positioned by the act, anybody claiming to have been fujured by his conduct that the provening the prov may intervene within three years thereafter, and be admitted as a party to the suit, and shall have judgment for the damages resulting from such injuries in exactly the same manner and extent as if he had begun an independent suit to recover damages. When a combination has used any patent in any manner pro-hibited by the Act and has been adjudged to have vionibited by the acc and mas been adjudged to have vio-lated the Shraman Anti-Trust Act, the court may par-tition its severajty among groups of stockholders are sell it in parcels as a single and forbid former stock-holders to buy at the sales. Whenever it appears in a civil suit by the Federal Government under the Shera civil suit by the Federal Government under the Sherman Auth-Trust Act that a patent has been used in any manner prohibited by the Oldfield Still, any person or estate threatened with laggry may at any time intervene as a party. Whenever it is alleged in an action by the Federal Government under the Sherman Auti-Trust Act that a patent has been used in a prohibited manner, no department; es official of the Unised States shall contract to buy anything from the defendent of the first contract to buy anything from the defendent of the first contract to buy anything from the defendent of the first contract to buy anything from the defendent of the first contract to buy anything from the defendent of the first contract to buy anything from the defendent States and a contract to our anymous account on the subsidiaries until the allegation "be found on final debens to be unfounded" unless so substitute at

spinal efficie and of a reasonable for the second of the s metically stable? Why not abolt entirely and thus prevent the inve from enjoying the fruits of his impanies; at the manner contemplated by the Constitutional would at least be legal and constitutional substitute Oldfield Bill is not. But it, we just as ridiculous.

#### Longer Ships Longer Pleas

THE application of the German strainester, as panies for permission temporarily the special their piers at Hobelen in order to accommod their larger steamship, and notably the "impresse which is due here in May of next year, has been rejected by Secretary of War Stimson. The action of the Secretary is an indorsement of the opinion of the same Secretary is an indorsement of the opinion of the same sustineers, who believe that any further extension of the piers, even of a temporary character, into the fair-way of the North River would be determined to the interests of the port of New York. To the army send-neers is intrusted the guardiannily of the rivers and harbors of the country, and it is their daily to see that no encroachment is made by private or corporate interests on the anchorages, channels, or fairways of the country by such interests at the expense of althpling is general. Although the channel at New Yest between the Manhattan and Jersey shores has a clear width between pierhead lines of about half a r the army engineers believe that this is none too n to accommodate the present traffic, to say nothing of its robable harge increase in the future.

If the War Department is to have its way in this

If the war Department is to have its way in case matter—which is not by any means certain—the question of making provision for these big skips becomes every presenting. It is fattlie to protest against their ever-increasing dimensions; for their growth is due to a fixed commic law, well understood in the field of transportation; and that the sun will rise to-morrow is scarcely more sure than that the one-thousand-door is scarcely more sure than that the one-thousand-foot ship, within a few years, will be aftest upon the high seas. Furthermore, their port of call in the western hemisphere will be somewhere on the Atlantic seaboard hemisphere will be somewhere on the Atlantic seaboard of the United States, and it can be safely predicted that the port will be New York. Where, then, shall these huge vessels be accommodated? Boston and New Jondon are out of the question; and the terminus at Mondon are out of the question; and the terminus at Mondon are out of the question; tauk must ever, for ust ever, for economic reasons, remain a mere Passengers will never consent to a change uream. Passengers will never consent to a change from the spaceton comprot of an ocean liner to the comparatively cramped quarters of a Puliman car, merely for the sake of taking a two-hour ride through Loug Island into New York. They will always ask to be carried to the city itself and as near to its heart as sible. For this reason the proposal to berth the ships at South Brooklyn will be always unpopuis possible. lar. It begins to look as though a new steamship center would have to be formed further up the Hudson River, and piers of 1,000 feet length or over constructed by excavating, if indeed this should prove to be necessary, at their shoreward end, in order to secure the desired

figth.

The Scientific American, however, is still of the opinion that the requested extension of the piers should be granted, and this for the reason that the width of the channel at New York is far greater the er of the leading ports of the world. If the War Devalues on the resuming ports of the word. If the War De-partment should allow an extension on each side of the river sufficient to accommodate ships one thousand feast in length and then establish a plerhead line which should be irrevocable, there would still remain a fair, way several hundred feet wider than that of any other sennort of the first rank

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MacHair Station is Argundan.—The Argundanist has established a meteorological station spaling. Frevious of Cordoba, at an altitude of

a flow German University is to be established at imbligation the Main. A number of existing educa-cial that selective institutions, including the local state institution in the Chysikalasher Versin, will be because by the university, which will be further built by relation donastions and doundations. About \$1,720, Dit already available.

"Eleva in Sileccia Freez,—To bleach ivory ornaments or plants in Sileccia Freez,—To bleach ivory ornaments or plants heavy the following method works well. The orna-ments were first washed or "onelest" if possible in a bath of unatable line, which has in it is few ounces of bean spil swince. This should make a pasty solution if pro-payly suitased, and will bleach the lovey which is discolored are stained. It should be rubbed off with a cloth and the manner of the stain of the stain of the stain of the stain. gisinst. It should be rubbed off with a cloth and the my diffiel in magnesis powder. After a few minutes a withdraw with a cloth gives the ivory a brilliant polish.

who Hanner Delivers the Hanler Lecture.—The an-most Hanley Lecture to the Faculty and students of Charles Cross Hospital was delivered this year by Prof. Simon Flemme of the Rooksfeller Institute of New York. Simon Farmer of the Rookefeller Institute of New York. We subject was "Gome Problems in Infection and Its Control." Not for many years has so great an Interest been taken in the Huxley Looture. Long before the hour fixed for the proceedings to begin in the theater of the haspital, every available into 67 space had been taken by as distinguished a medical audience as ever attended the control of the proceedings of the control of his important event

New Instrument for Analyzing Gases.—By the use of a new German instrument, which takes the index of refraction of mixed gases, Haber and Lowe are able to find the amount of earbon dioxide and methane con-tained in mine gases. The method is also useful in many tained in mine gases. The method is also useful in many stake cases und as for beand vapors in the gas distilled by gas or coke plants, also sulphurous anhydride in the gases coming from pyrites roasting, as well as percentages of comes in the sir. They are also able to check the purity of hydrogen made by the electrolytic process, observe the gases in human breath and carry out other very useful tests. Recently O, Mohr applied the method to analyzing the products of combustion of fur-maces so at to have a useful check upon the way the fuel is being burned.

Berrelly's Comet.—A telegram received at Harvard from Prof. A. O. Leuschner, of Berkeley, Cal., gives the following elements and ephemeris of Borrelly's Comet, computed by Nicholson and Lanceador' from observaber 3, 4 and 5:

ELEMENTS Time of perihetion passage (T) 1912, Oct. 20.53 G.M.T.
Perihelion minus node (©) 98° 52′
Longitude of node (I) 143° 16′
Inclination (I) 124° 52′

(q) 1.105 Perihelion distance

		3	Срне	HERE	8.			
	G.M.T.			B.A.		Dec.	Light.	
1912	November	8.5	18	m. 82	13	+28	51	0.88
		12.5	18	53	56	+22	54	
		16.5	19	11	36	+17	38	
		20.5	19	26	18	+13	04	0.51

16.5 19 11 36 +17 38
20.5 19 26 18 +13 04 0.51
Amushose's North Pelar Expedition is now assured, shauks to the liberaity of Pepto Christofreon, a rich Nowegan Ilving at Buence Aires, whose financial aid measured properties the journey within resulted in the dissection of the Buence Aires, whose financial aid measured properties the journey within resulted in the dissection of the South Pela. The explorer returned to his leasa in Nowey the 1st of August, where he has been partition; the least touches to the report of his recent journey, defluency lectures, and hastening peoperations for life free theorems of the first at Stunton Aires, was expected to silk in October for San Francisco, to complete fielding out, and the start from that poor to Reference and the policy of the first the start for the start of the Reference and the policy of the first thing the second of the start of the second of the second of the start of the second of the start of the start of the start of the second of the second of the start of th

W. Buga

Aviotien in Engls resonance available in England.—Owing to the moseum which the public subscriptions are having in France for the purchase of aeroplanes for the army and the poor results coming from a like subscription opened the poor results coming from a like superspace of the poor results coming from a like superspace of a fixed and a fixed a fixed and a fixed a dressed a new appeal to patriotic sentiment in favor of military aviation in England.

From Lendon to India.—The well-known English aviator Cody is making plans to take part in the flight from London to India. This event has lately been organized and is likely to be of great interest on account of the uses and is likely to so of great interest on account of the unusual length of the trip. Several important prizes are to be awarded for the flights. However, the organizers are likely to postpone the event for some time, owing to the fact that the original path lay across the Salkans.

Mosument to Latham.—After Biériot, who has a monument ercoted near Calais to commemorate his cross-channel flight, Hubert Latham is now to have a monu-ment as well. This will be located on the heights of the as well. This will be located on the heights of the atte cliffs at the point where he started on his flight. Sangasta estifies at the point where he started on his flight. A group of sportmens are organising a subscription for this purpose, so as to commonwrate this two attempts to cross the Channel, in one of which he practically succeeded, as it will be reasonbered that he came very near landing on the Bugistin const. Latham was the first aviator to have the first considered a very bold attempt at the time. We may also meastion that a very bold attempt at the time. We to erect a monument to aviation pioneers, and especially to Wilbur Weight, at the Auvours camp.

Stabilising Parachutes for Aeroplanes.—Trials of a new stabilizing parachute for aeroplanes were made re-cently at the Eiffel Tower by the inventor, Triaire. On this occasion the apparatus was a reduced model of one-quarter size and had been ballasted with lead, the total quarter size and had been ballasted with lead, the total weight being 160 pounds. The acropiane is of the mono-plane type, and provided with the new device it was raised by oable to the first platform of the tower. After being placed in the most unfavorable position as regards capacing, the acropiane was dropped, but it was able to right itself after a rapid fall of some 30 feet, and then right itself after a rapid fall of some 30 feet, and then landed on the ground without any damage. It was notised that when the secoplane, which had shout a 10-000 speed, was let fall, a strong wind oversumed it on one side, but the stabilizer asted at once to restore the machine, and it alighted slowly at the base of the tower. This is the second trial which the inventor has now made ith his device, and its success appears to be so clearly shown that he proposes to apply an apparatus upon a full-sized aeropiane and will pilot it himself in order to give a convincing demonstration.

Artsian in French West Africa is discussed in La-Calenique Africaustique by a superior officer of the French colonial infantry. Many possimistic statements have been published regarding the difficulties of aviation in the Salans and adjacent tropical countries—warping of wooden frames, ologique of the motors with saud, rapid evaporation of gasoline, difficult country for land-ing, and what-not. Hence it is highly gratifying to learn from an authoritastive accure that all of these state-ments are erromess, and that actual experience has proved aviation to be, on the whole, neither more diffi-cult nor more deageness in the heact of Africa than in the heart of Frames. Military aviators have made many long flights in the neglen in question; once of them covering about 380 miles. In Senegal it is found that the sand began by the winds does not extend more than Aviation in French West Africa is discussed in La covering about 350 miles. In Senegal it is found the sand borne by the winds does not extend more two or three hundred vards above the ground. It is two or tarse munared yards above the ground. It is evident that the new arm of the military service will greatly facilitate the administration of these colonial possessman. The nomadic natives still indulge in fre-quent raids, which will probably be entirely suppressed by the combined effects of the avistary and the militarists opers mounted on swift camels).

Hadro-ascopiance in Hanger-Raperiments with new trytho-accopiance beingsatively caused on in different parts of Europe statignant-account we may mention the tests which Bearmont-sensity and provide filled near Paris with a Donnet-Leveges (20 thems-power machine, taking on Donnel-Levengues (60 'Access-newer machine, taking on board Mr. Kowe, on suginore representing the English Visions satisfishments. Then the machine was taken apart and shippartic Highlands, when Reamons it to put it through the difficult town required by the Admirativ. On the same they, Malling made flights with a 80 horro-power Thumarite requirements, while Mr. Love pijoted Viscously the offinish deels required by use it through the offinish deels required by use. On the same sings, finishing snade flights with a 50 horse-power. Stammbiographenealshin, while Mr. Love piloted a third medicing-state of 40 horse-power. In the Meditarransan, the finishing state of 40 horse-power in the heading states. Assists, demanded and Robert are making the finishing states of the finishing states of the finishing states of the finishing states. Assists, finishing states great thill in nighting on the states, finishing states which is colored for fauly. In Switzerland, Burri, shipsing down place flowing the typing out a masshine which is ordered for fauly. In Switzerland, Burri, shipsing on a Switzerland, Burri, shipsing on a Switzerland, Burri, shipsing on a Switzerland on a Summer hydro-sepathen, closed the sweate-of-the-land place.

#### Automobile

A Wind Shield for Motor Cycle.—The patent, No. 1,042,305, to Chauneey M. Wright of Philadelphia, presents a wind shield in which the shield member is clamped to the handle bars of a vehicle and springs are arranged between the portions of the shield member and the clamps, thus cushioning the connection with the vehicle

How to Clean Spark Plugg .-- A good way to clean park plugs or any mica substance is to first wash in a 10 per cent solution of acetic acid, which cuts crease and to per contrastation to see a cent, when cuts grease acarbon deposits. This should be washed off by gasoline and then the plug dried by rubbing with a cloth or waste shreds. This works exceptionally well on all mice substances, but is good for removing carbon deposits from other articles.

Driving Out the Horse-car in Wurtemburg.—The government of Wurtemburg, (termany, is taking steps to substitute autobus lines for all the horse traction lines existing in the country, and it is now engaged in drawing up the plans for the project. The department has already entered into conne ction with the leading German auto mobile constructors in order to secure their co-operation in the enterprise, and bids will no doubt be called for in the near-future. At present the department has not made any definite decision in the matter

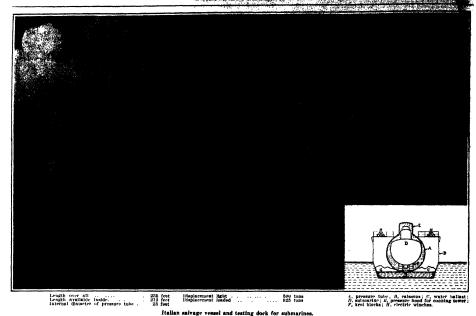
Car for Transporting Automobiles.—The Orleans Rail-CAT for Transporting Automotibles.—"Into Virteass, read-oration carrying automobiles where the latter are peaked one for carrying automobiles where the latter are peaked in closed boxes. The new our is about 22 feet long and 8 feet in width with a somewhat greater height, and owing to the roomy space which it affords it is able to carry the largest automobiles. These are leaded into the end of the car, which is fitted with two folding doors and a flap which is let down so as to make a platform flush with the car floor. Side doors in the car also give access for carry-ing out operations. A set of cleats on the floor and also solid straps at the sides, allow of fixing the automobile body in the best manner to avoid all shifting on the road.

A Hospital on Wheels. -The now French Schneider ambulance is a veritable portable hospital, being a truck of probably the largest size yet constructed and having an operating room in the middle part, with two smaller an operating room in the mindre part, with two similars rooms at the code. It contains an electric plant which is used for lighting, water pumping and sterilizing and for surgicial motors. Water is pumped in by hose from a well or pond, and offer passing through the ultra-violet ray sterilizer it is stored in a tank. When the ambulance is brought to the spot, for instance on a battlefield, a wing in the shape of a tent is formed by a tarpaulin on each aide of the wagon, and the two tents are electrically lighted through windows in the sides of the car.

A Beftigerator Motor-truck.—A 35 horse-power truck of the De Dion type is in use at Buenes Aires for transporting mest, and it is designed as a refrigerator car on the most approved principles. The presentear has a body of unusually large size and height and weighs 5 tons. In same connection we may mention a De Dion car for ice delivery which is now in circulation at Hayana. has a 24 horse-power motor and the total weight is 3.3 tons. The same establishment is building a number of cars of automobile-ambulance type for transporting the wounded. These are con.paratively light and rapid. One of them is in use by the city of Mullhausen (Alsace) cond has been supplied to the relief co tee of Havre.

Transport for Race Horses.-Among the new French Transport for Mac Horees.—Among the new French power wagons built for special uses we note the track which was delivered to Mr. Gould at Paris and serves for transporting rose horses. It is a roomy van with the driver's seat in front and earries a 30 horse-power motor. Built according to the Latil system, the front truck is motor driven and forms a unit with the motor and mechanism, leaving the rear axle free. A handsome car of about the same design was also built for Mr. Vanderbilt. amout the same design was also built for MT. Vandorbitt, Another Lattl car is mounted as a street sprinkler and sweeper and is used by the muncipal department of Paris. A largo trude of the same type is built for trans-porting aeroplanes. The van can be tilted down to the ground level in the rear so as to unload the aeroplane by sliding it down ways

Four-wheel Drive.—The new Panhard power wagon has an original feature in that all four wheels are driven as an original reason in that an ionic whose are driven as well as stered, all the wheels being operated by a single differential. At Satory, near Versailles, a tractor of this kind was driven up a bank 14 inches high and over a log 16 inches in diameter. Using the first speed or 2 miles an hour, it could run up a bad piece of chalky or 2 miles an hour, it could ran up a man proce of onesay road containing ruts and having a 28 per cent grade. The maximum speed was 10 miles an hour. With a trailer weighing 6.5 tons it could mount a 9 per cent using the first speed (accelerated), and with the grade using too mix spoot (soverexeav), and win too second speed, or 4.5 miles an hour; is elimbet a 4 per cent slope. The same slopes could be elimbed in first and sec-ond speeds with a part of 5-too intentiors serving as trailer load and representing a total of 10 tons drawn by the power wagen. The truck has a 6-yulinder 35 horse-power motor. A drum on the ear allows of eable hauling at a speed of 1.2 miles an hour and a pull of 4 tons.



## Salvage and Testing Facilities for Submarines

By R. G. Skerrett

THE difficulties encountered in raising The sunker littles automathe "AS" have in them a note of warning for us We are steadily adding to our flottilla of under-water carft, and yet we have no proper facilities in the Government service for the prompt satisface of any of these boats should they be carried suddenly to the bottom. We have been fortunate so far in excuping serious accidents, but that is no reason for assuming that we are any more likely to be immune from disaster than any other naval service. We should profit by the catastrophes which have befalled England, Russia, France, Germany, and Japan, and no longer colinue unprepared for kindred misbags.

Public opinion, revolting at the inaction

Public ordalon, revolting at the inaction of the Mindstr, of Martin and reaching a climax of indigenation at the delay in raising the unfortunate "Pluviose," forced the French authorities to undertake the errors authorities to undertake the construction of a suitware vessel especially adapted to deal with sushes nuturaries. The accompanying illustration shows the boat provided by the French government late last year. The Germans anticlusted the French in this particular, and their special salvage craft, the "Vulkan." proved useful when the "IRS" snak in the Battle may than a year ago. England is slowly equipping herself with the same character of vessel, but the difficulties that have attended the raising of her serval submarines that have gone to the bottom have shown the insadicious of the

apparatus at present at her disposed.

It is not pleasant to think that men may be carried to the bottom in underwater boats under circumstances which make it possible for them to survive in their confinement for many long hours and yet, in the end, die because the solvance cultipased is in tandequate to cope with their relatively specifically raising. This has happened introd, upon several occasions.



The German salvage vessel "Vulkan." Can lift 500 tons 25 meters in an hour.



The jesting deck before launching, aboving the calseen or globalar stopper

under harrowing conditions, and it may occur here if some provision is not promptly made to prepare for just such an emergency. It is not fair to the men that take the risks necessarily involved in service aboard submarises to hedatate longer in building the required saivage amountum.

apparatus. There are some kind of accidents which may send a submarine to her doom and against which no foresight can provide; but, again, there are other circumstances which may cause a submarine to sink and which may be either entirely eliminated or largely minimised by prevision. To a large extent, this anticipation of accident lies in making the submarine strong enough to resist the stresses of deep submergence and in equipping the boat with pumps and other tried means for the expulsion of water bullast or for the neutralifung of reasonable leaks at those depths. It will be asserted authoritatively that we are now taking these very steps, and it is a matter of ecomon knowledge that our submarines, before their final acceptance by the Government, are sectually subjected to a submergence test which requires the boats to be sunk, without any-one aboard, to a depth of 200 feet. The larger than the control of the control of

But there are eisometaness incident to the present method of subjecting the halfs of our subnarrines is net witch use far from ideal, and they do not give a seeindex of all the osselfations white-likely morrantly not duty upon "the definements. At the subjection is the second

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The special salvage vessels already built in Germany and France and under construction in England can help in certrying out test submergences of submartines, and do, in fact, provide more fiscible facilities for this operation than the ordinary wrecking derrick and lighter which we utilise, but it is still accessary that the submarine be carried to deep water for the purpose, and deep water for the purpose, and deep water in not always conveniently available. Perhaps the inspectors would be more willing to go down in the submarine undergoing test if the boat were attached to que of these special salvage craft, but this is a matter of speculation. At present, we have no salvage vessel of this sort, and, even if we had, it would not be the best solution of the problem as it has developed with the growth and the wider service now exacted of under-water tor-pedo boats. It is to Italy that we must turn for the most startling development of a submarine auxiliary, a structure which combines the virtues of a special salvage craft with a testing dock of a novel and extremely valuele character.

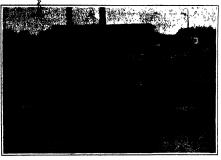
There has recently been knuched at Speak, Italy, for the Italian navy, a craft of this dual character, which is far ahead of any other equipment yet provided by the various maritime powers having fortilise of submarine houts. The Laurentt teeting dock, designed by Major Cesare Laurentt, technical director of the Flat-San Glorgio, puts the submergence trials of a submarine upon a thoroughly safe and practical line of procedure, and, at the same time, makes it possible to obtain at first hand data of the utmost importance not only regarding the physical possibilities of the particular submarine undergoing examination, but also information which will point surely to the way to make improvements.

We must not forget that the dual service required for a submarine on the surface and under water demands a form of hall which must, of necessity, be a conprenies. The spindle shape is best for autonoged speed, while the-ship form issufa inself better to agrince conditions and rapid propulation on the water. The circular cross-section of the spindle is the simplest and the least expensive unit of strength, while the slightest or ship-whaped section is naturally weaker and liarder and more costly to build for any units of great strength submarined. Each shape of form, therefore, demanded by sufficient of uncertainty, and the real strength of any encodes of uncertainty, and the real strength of any encodes of uncertainty, and the real strength of any encodes of uncertainty. and the real strength of any encodes of uncertainty and the real strength of any encodes of uncertainty.

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Bow view of French salvage vessel for submarines.

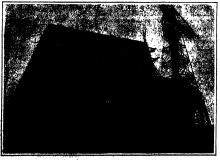


The testing dock in a drydock with the workmen engaged in withdrawing the caleson.



French salvage vessel.

Displacement, 2,800 tons; length, 322 feet. Can lift 1,000 tons from a depth of 120 feet



Stern of French milvage vessel, showing catamaran arrangement of the

Free succe between hulls, 41 feet 6 inches.

modest outlay and to try experimental sections without the building of an entire submarine. This is an advantage of incalculable value, and the beauty of the scheme is that the work can be done at the shipyard and in shallow water.

The Laurent equipment consists fundamentally of a long steel tube A, capable of withstaining, high pressures exerted from within, into which a submarine D can be floated and secured, after which the entrance is hermacically sealed. In our picture, the gateway is shown on the left sealed by the convex calsson. The pressure tube is supported by balliast tanks A, which can be filled with water ballast troops are tubed as execution requires. The dock has its own power plant and its own pumping engineers. A removable hood B provides a housing for the coming tower The tube is supplied with keel blooks P, and electrically-driven capstans B. B. When the submarine is held within the dock and surrounded by water filling the tale, as shown by the small diagram, presenter is exerted upon the enveloping water by a suitable steam lump, and this pressure can be raised go itly in excess of the hydrostatic presseries to which a submarine would be likely to be subjected voluntarily. Observers regain in the submarine while undergoing this pressure rial, and telephonic findilities keep them in touch with those in charge of the dock and the pumping plant. In this way, the inspection can be carried on deliberately and exhaustively, and all of the operative mechanisms can be put in motion and tried under physical conditions truly reproducing the circumstances of actual deep submergence. There is no hazard involved, and the whole operation can be conducted eight at the building yard.

Our illustration also shows how the Laurenti dock can be used as a salvage apparatus. In this manner a sunken submarine can be raised and carried into port or borne to skallow water, where she can be opened and entered if such an operation be destrable. In addition to being a testing dock, the Laurenti submarine auxiliary can also be employed as an ordinary floating dock for under-water boats, and in our picture the plating is removed amidships to show a submarine resting inside upon the keel blocks.

Nothing clse designed up to date can be compared with Major Laurenti's invention, either in its practical advantages in meeting the varied possible requirements of submarines already built or in providing a guide for future development. The dock in question is long enough to accommodate a submarine of 200 feet in length and has a displacement of 500 metric tons when light. The dock's maximum displacement of 525 tons, at which time, with a large submarine inside, the structure draws only 10 feet of water.

#### Progress of a South American City

DROBABLY. there are educated people in the United States of North America who have never heard of Sao Paulo. This Braditian town, the capital of the searce of Sao Paulo. The Braditian town, the capital of the searce of Sao Paulo. The Braditian town, the capital of the searce of Sao Paulo. The se

## Flying-Boat Races

By f.lenn H Curties

I is not difficult to understand why a sheet of water If is not difficult to understand way is such affords an ideal acrodrome. In the first place, the alatter does not have to run along a given course to start and he can always head into the wind. Then fraction the surface of the water is sure to be be whereas it mean aititude a field which looks level may thir cut to be quite impracticable as a landing place Arother advantage of water flying is that the wind is much steadler over the water. Altogether, it is much easier and safer to start and alight on the water than Altogether, it is much on the ordinary flying ground. In addition to this, if as a result of careless landing and the inexperience of the operator an accident does happen, it is not likely

The hydro-acroplanes gave us all these advantages in water flying but the new flying boat gives us in addition the advantages to be found in a boat with its large surplus of buoyancy seaworthiness and pro-tection for the aviators. The new Curtiss flying boat, will ride as rough a sea either under power or adrift, as any motor boat of its size and flies as well as any neroplane of equal proportions so that the combination

gives us the advantages of the motor boat and the aeroplane combined and there are i) limitations to the development of this type of machine

The many fatal accidents to exhibition fliers using land machines has directed the attention of all interested in aviation to the fiving boat. This machine offers a means by which aviation may be en joyed as a sport and developed and ad anced as a science without the dangers which heretofore accompanied flight

The fiving boat shown in the illustration has a hall 25 feet long by 21/2 feet beam carries 250 square feet of feet beam carries 250 square feet of plant surface and an 80 horse power wa ter cooled motor with a propeller attached direct to the engine shaft. It has a carry ing capacity of (RN) pounds and will carry fuel supply f r a flight of 100 miles—It is fitted with dual centrol—so that either enger who sit side hu the operator or passenger who sit side by side may assume full control of the ma chine

In starting from a standstill in the the machine after attaining a speed of about ten miles an hour rises to the surface on which it travels as a hydroplane until it reaches a speed of 45 miles an hour relative to the wind when it will leave the water at a slight inclination of the elevator. It maneuvers quite readily on the water at all speeds. and will turn circles of a short radius (ither at high or low speed. The boat is built very strongly as it must necessarily be to withstand the shocks of starting and alighting in rough water

The accompanying illustrations show two of the new flying boats and a hydro aeropiane in the first race of the kind ever held. The race was arranged for the students and visitors at the Curtiss Aviation Sch of at Hammondsport on the afternoon of October 28th All who witnessed the race are unanimous in the opinion that yachting with the flying boat

opinion that year, with the jung coat is destined to is one of the greatest of sports. The sight of three machines jockeving for position was inspiring while the close finish of the return trip would stir the blood of any sportsman. The three machines were all fitted with the same engine power machines were an intent with the same engine power but the fiving boots proved specifier in the air and faster in making turns on the water a rule of the contest being that the machines must round the buoy on the water and must fly only between the starting and finishing points excepting on the third lap which

#### Some Developments in Wireless-I By John Hays Hammond, Jr.

S IN E the first conquests of space by Hertzian waves, what has been the main development in the perfection of wireless communications? It may be stated that the chief inventive energy has been concentrated on the practical problem of increasing the effective range the practical problem of increasing the energice range of infrecommunication and the selective of the in dividual system. In 1897 Mr. Marconi transmitted increases to a distance of 8.7 miles. To-day Mr. Mar ni saws that the maximum effective distance of 1111 smission is 6.000 miles. It is evident from a con silitation of these figures that not merely a quanti i ii change has been made in the system of trans-mitting, energy but that vasily improved means of effoglisch utilizing this energy has been made

nection to 44 In this cos a Arco estimates that whereas a few years ago only von Arco estimates that wheens a few years ago only 50 per cent of the available energy at a station was used in radiant energy to-day, by quenching the esti-lations in the prinsatey drevels. To be once of the energy is converted into useful work. Title remerkable advance in power estenger has been brought about thelefy through the better understanding of the condichiedy through the better understanding of the condi-tions that would aflew of more sustained electrical conditations in the open circuits of the transmitter. The receiving stations, on the other hand, have been rendered infinitely more sensitive to the reception of weak signals 'by' 'Staterding the cohere' 'pitchejie' or wave detection. The others, whose principle is gen-erally understood, was discovered as early as 1870 by Prof. Hughes, and rediscovered in 1800 b Franky. This instrument was used for several years in commer-cial practice, but was discarded come were use of the call practice, but was discarded some years in commer-cial practice, but was discarded some years ago for numerous more sensitive detectors. To-day the tel-phone is used in conjunction with suitable detectors, and has been found to be astonishingly sensitive to and has been round to be amonimingly sensative to small currents. Besides modifications in the apparating to insure the greater sustainment of electrical oscilla-tions, an important discovery of Lord Rayleigh was recognised as an essential factor in designing a wireless system This discovery is the physiological law that



Two flying boats and one standard hydro roplane jockeying for position at the start of race.



Forty-five miles an hour on the water



Finish of race. David McCallock in his flying boat loads; Lincoln Beachy is second; Francis Wildman is third.

the human ear allows us to hear best, sounds of be-tween five hundred and one thousand vibrations a second Accordingly, alternators were built of 800 cycles, a thousand electrical impulses per second were produced at the sending station, and the receiving of erator heard a high musical note. In this way not only may we consider that the receiving instruments only have been rendered more sensitive, but the human ear itself has been made to respond better to incoming

The Problem of Selectivity.

Another important pursuit in wireless has been the development of means to usedure a selective intercommunication between the sending and receiving stations. mulcation between the sending and receiving stations A certain amount of selectifity has been obtained on the principles of electrical tigning. Many of the weightes in economical long fibbrance trainmission receiving the requirements for advanced training, and in this way the theoretical development of wireless is well as wareed. The chief source of trouble lies in the fact that practice does not care to keep pace with theory, and for this reason, insufficiely station entiting either a pure electrical tone or an adoption tone, through the promote the control of the senderly in the next control of th in pure electrical comes or was accounted tools, in what we found that much of the appairtuist in use is of precisi-toric refinement. Sing a clear essainined note into an open plane and you will hear a string of the identical pitch vibrating. Sing a registry descending scale and you will hear several actume vibratio. The first nethod

S . T MAIN MANAGE NO. in a simple, conting, pure wire. This, after het which are so powerful faits that shapes and a reduct to principe electricity in their own country. For the immediate presents produced to the most practical immedia for The pieceer leaders in the adoption and of the suntained coefficient prisons are the superior and the suntained coefficient prisons are in this country, and "addensity My content in this country, and "addensity My content in this country, and "addensity My content to the suntained coefficient have been presented to the suntained coefficient to the suntained that the country, and "addensity My content are sufficient to the suntained that the suntained that

and Vergener Pools tors have suggested roja. These two inya widely different means videly different means to obtain the same a sea has made use of the principles of Their ing are, while Fernanden has developed alter rest, generators which have the remarkable ing are, which have the remarkance answering specialty from \$6,000 to 200,000 alteristical coloring from \$6,000 to 200,000 alteristical coloring control per second. Alternatives, at this Section 21 Montrie Company, designed these machines is they represent a triangh of constructive staff of they represent a triangh of constructive staff of the per section of the staff hear of the mechanism is a clear rounting at a greet of 20,000 revolutions per minutes. Mr. Alexandaration says: "The diameter of the disk being one food, the pertuberal speed is 1,000 feet per second, or 700 middle an hour; in other words, the disk would pell over to Europe in 4 hours." These mentions are

Europe in 4 hours." These matchines are to-day on the open marked, and their general adoption will be a great fatche in eliminating much of the present interference. Errat Euthner, the German scientist, believes that the Vessenden method will undoubtedly be the method used in the future for the production of pure electro-magnetic waves. The limitation of the high frequency alternator, however, is due to hysterisis losses in the iron which limits their efficient outputs to long wave-lengths.

Present Success in Avaiding Inter-

ference.

The near future of wireless will see improvements following along the general lines of increased range of transmission, and better means for procuring immunity and better means for procuring immunity to interference. In the pursuit of sele-tivity, however, I believe a different course of development will, he followed from the lines higherto adopted. True immunity to extraneous interferes immunity not merely to static atme charges or forced oscillation effects of powerful neighboring stations, but it must be immunity to intentional interference This phase of interference has been already developed in the German navy, and a machine has been constructed on the principle of a siren. The operation of this machine is somewhat like singing a rapidly descending and ascending sos near a piano All wave-lengths are momentarily emitted and a tremen source of interference is produced. ans do not interfere with thems for they simply omit the note they use from the dispason of the siren. A spark gap placed directly in the antenna will also produce an equal disturbance. ve going to avoid the effect of the intelligence destroyers? By perhaps one method the use of a system operating through the conjoint action of two or more waves of very different character-

more waves of very different characteristics Tuels shows a system in a patent granted in 1008. Each of his individual waves of different frequency closes a certain relay, and before the deal indicating device operates, it is necessary that a number of relays be closed, each by a different individual wave. In order, therefore, to create an interference, it would be necessary to determine the combination of the waves used; and slace the possible combinations swylminists, the general theory of the system problems in the combinations of the combinations of the combinations. The use of relays, herefore, the combination of the combination hibits intentional interference. The use of relays, how

nints intentional interference. The use of relays, over, problishs the practical use of the system. Prof. Pessenden was granted a patent in the year on a system utilising the same fundamental, edges of doopnative ware. He, however, set fair greater luminity to extraneous disturbance for greater immunity to extraneous determinance by injectiful the system had by the electrical Propuncy of his beausetiful greaten had be the electrical Propuncy of his beausetiful greaten by the country of the count

The Louis House House

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The warm of Unancement Actions.

Miller of No. Science and Actions and Selfer of No. Science and Actions and Selfer of No. Science and Selfer of Actions and Selfer of Actions and Selfer of ing the resistance apparently essential to cause the se of the shell inside, to be encountered? In other ds, is the end of the tripping rod larger than the mesh he torpedo net? If it is not, is the head of the torthe torpe and armed with any outting appliance for foreing its

From Mr. Skerrett's account, I gather that the trip ping red cannot come into action until an effective ob struction is actually encountered by it. If my reading is correct, and the head of the rod is not larger than the mesh of the net, might not the torpedo simply be caught by the net and ite outside harmless?

Port Elizabeth, Cape. APRICAN READER.

#### A Simple Rule for Determining the Direction of Gyrescopic Forces

To the Editor of the SCIENTIFIC AMERICAN: it me to call your attention to an important error Pearson's letter (October 26th, 1912) on the gyroin Mr. Pe scopic action of the Gnome motor in Miss Quimby's

quote his exact words, your correspondent says

(9. 347):
"Take a gyroscopie top. Set it rotating, and held it in
"Take a gyroscopie top. Set it rotating, and held it in
front of you with the axis parallel to your line of visiting in
that it revolves clockwise as you look at it, the settle is the
Gnome motor when we need from the pilot's seat of a Bleriot.

\*\*Example of the pilot's seat of a Bleriot. Turn it charply to the left, trying to keep the axis horisontal. Note that the forward end of the axis dives deunward in spite of you. This it quickly up, and note it swerves to the left."

Both of these statements are incorrect. If Mr. Pe will actually try the simple experime scribes, he will find that the behavior of the gyroscope is precisely opposite to that which he predicts. In fact, under the conditions stated, if the top is turned to the left, the forward end will rise, and if it is tilted upward, it erve to the right.

The fact that an error of this kind can occur in the disoussion of so important a case as the fatal accident to Miss Quimby, seems to show that there is still much hazies in the minds of aviators concerning the dire gyroscope out of its position, the axie, instead of yielding gyroscope out of the position, the axis, mireca or yearing perceptibly to the applied force, will move (or tend to move) in a direction of right angles to the force. But, unfortunately, there are two such directions, and many persons appear to be at a loss to decide between them.

For instance, if we push the forward end of the axis to

the left, it will certainly move either up or down; but the important question is, which will it be—up or down? -up or do

A very simple rule for deciding this question is the fol-wing, which was first published by the writer in the wing News for June 21st, 1919:

magnerous. News ter Jame 21st., 1940:
Amingine the deflecting force to be exerted by the pressure
of a flet board pushed against the sprinting cale of the gyro-scope, and may the direction in which the cale, if rough would tend to roll along the board. Tale will give the re-

rired direction of motion for that end of the axle.

awald lead to roll along the board. This will give the serviced direction of motion for that end of the axis.

This rule is immediately applicable in any position of the same relationship of the same policies. The rule is immediately applicable in any position of the applied forces.

For example, in the case circle in fig. Pearson's letter, a fertile suming of the sarrophase to the left may be thought of as done to a greatest control by a (vertical) bringly possing the fernioned and of the said to the left. If the same is the results of the left, if the said is received in the distribution described, it would tend bringly up the branch. Scena the securious would require the said to the left, if the said is received to the left. If the said is received the said of the said to the left in the distribution described, it would tend be said to the left in the distribution of the said the said to fill the resulting or hand to the control of the said the said to the said to the said to the left in the said to the said

to list toward the left. That is, the gyroscopic action of the paddle-wheels, in so far as it has any appreciable effect at all, tends to make the vessel list toward the outnde of the curve.

The rule is thus seen to be capable of rapid and a ate application to a great variety of cases in which any of the older rules seem liable to leave one in doubt as to correctness of the result.

EDWARD HUNTINGTON.

ant Professor of Mathematics, Harvard University. Cambridge, Mass.

#### The Bureau of Chemistry and Its Work

To the Editor of the Scientific American:
One cannot need the Scientific American for any length of time without being impressed with the keen presticality, the philosophical insight and the fairness displayed in the editorial writings. To such a reader nt attacks on the Bureau of Chemistry cannot but be disappointing.
Doubtless the Editor is honest in his attitude, but it

would seem that a scientific journal would be careful to present conclusive evidence when making an accusato present consituitve evidence when making an accusa-tion. What beside has the Editor for his statements that the simpleyee generally of the Bureau of Chemistry are incompetent, that there is no harmony or co-peration among them, and that Dr. Wiley while featiess and honest, is selemtifically incompetent? The principal argument advanced by the Editor to support his charge that the Bureau is incompetent, is

support his charge that the Bureau is incompetent, is that it was necessary to appoint the Referee Board, to check up the results obtained by the Bureau of Chemis-try. Is the Editor so naive that he believes that the principal reason for the appointment of the Referee Board was because of the sligged unscientifie character of the Bureau's contained and verse to sedimm bemoster's Was not a cry ord protest invisible from the users of was not a cry of process invitation from the users of present vatives regardless of the scientific character of the Bureau's work? It is certainly surprising that the SCIENTIFIC AMERICAN should been its charges upon the ent and work of the Referee Board in the fact that while the scientific character of the board

the next take while the scientific constitute of the locard is not seriously questioned there is no unanimity among physiologists as to its conclusions. While the Bureau of Chemistry is not composed principally of famous and highly specialized scientists I believe that anybody who really knows the Bureau will asknowledge that the personnel is of a very high chemical literature to realize to some extent the quality of work being done by the Bureau employees. It is true perhaps that a large percentage of the work is not of a research but of a routine nature. This must be so, as the great bulk of the Bureau's work is securing evidence of law violations and much if not most of this work requires routine examination. This work is required by law. Can the Editor doubt the value of these routine examinations, which lead to the detection of such violations as the addition of wood alcohol to exsuch rotations as the addition of harmful babit-forming agents to household remedies? This work is well and theroughly done and the public has reason to be grateful for its protection. Would the Scientista American do away with this work and occupy the time of the Bureau with such long drawn out and expensive experiments as conducted by the Referee Board, only arrive at conclusions which are equally indefinite d unestisfactory?

But the securing of evidence of law violations is not all of the Bureau's work. As an example of the Bureau's desire to use educative means to avoid violations of nesure to use educative means to avoid violations of law take the following instance. It was found that many samples of catsup were being collected which gave evi-dence of being of unsound. decomposed and collected expert was sent into the field to visit canneries and observe the practical conditions of manucanneries and observe the practical conditions of manu-facture. In his visits to these factories he was not only able to ascertain the source of trouble but by practical demonstrations with the microscope and otherwise he e manufacturer that he wa was suite to show the introduction to the cannot not to the continually producing unwholesome food. After an entire season of this work the Bureau was in a position to issue useful instructions to the cannors. It should understood that this is only one instance of the

be understood that this is only one instance of the Bureau's efforts to educate the public. But it is the insimuation against Dr. Wiley that is the most unjust of all. The editorial of March 30th, 1912, seets that the "Bureau of Chemistry needs 1912, estees these the "Bureau of Chemistry meeds a man of nits addle similarly attainments that there will be no niced of referring his decisions to a Board of Reference." Be Wiley's estimation standing requires no defense, but such a statement is so opposed to common interestable, which is should not be numericaled. Does the Edding equilables Dr. Wiley's recognition by the leading actualities and remission colorise of the world as being validated significances." The SCHETTURE ANNEADES THE PROF LAW "Dr. Wiley's Pure Food and Drings Acts." Could a man secure such a law in the face of "Speat Sepondarion and a man secure such a law in the face of "Speat Sepondarion unless be possessed intellectual qualities of an unusual nature?"

If the SCIENTIFIC AMBRICAN DOSS Dr. Wiley's scientific incompetence, it is its duty to present evidence of same.

I must confess that i am somewhat of a hero worshiper in this connection, as are most men who have ever had the privilege of service under Dr. Wiley There was certainly no lack of harmony and co-operation under Dr. Wiley's leadership. Almost every man even to the humblest, was inspired to believe was engaged in no ordinary work but was a real factor in the Pure Food fight. If discord occurred within the Bureau it did not come from internal causes but from disturbing causes without.

verdale, Md. HENRY E. NORWOOD.

The rank and file of the Bureau of Chemistry are fairly competent, on the whole competent enough to perform effective work under the direction of able divi-We cannot refrain from pointing out, how sion chiefs son enters. We cannot retrain from pointing out, now-ever, that of the six M.D. degrees which are to be credited to six of the Bureau's men, four were granted by a night medical school, the discontinuance of which was recommended by Abraham Floxner of the Carnegae Foundation on the ground that the curriculum was below the standard. One of these M.D.s was award-ed to the man who made the benzoate of soda investied to the man who made the benzoate of soda investi-gations under Dr. Wiley's direction and who at that time was only a medical student. Is it likely that a doctor who has received his medical education in such an institution can compare with a graduate of Johns Hopkins, for example?

Our correspondent urges that the work of the Bureau was principally routine in character; therefore secunific research does not appear prominently. This is the crux of the whole situation. The Bureau has always had a most liberal Congressional appropriation. Money was not wanting for any work that the Chief of the Bureau and his aids wished to carry out. What institution in and his aids wished to carry out. What institution in our country should carry on scientific research for the purpose of aiding the enforcement of the Food and Drugs Act by studying the scientific questions involved in food manufacture and analysis, if not the Bureau of Chemistry? But such constructive work was not put prominently forward, and the positions of the Bureau were not filled by the appointment of chemists who, by past training and proven ability would be able to do such constructive work.

It is evident that our correspondent is not sufficiently sequalited with the leaders of scientific thought in this country. Otherwise he would not believe was some chemists of the Bureau, as well as their former chief, have a high scientific standing among chemists. The benzoate of soda experiments, which Dr. Wiley and those who alder min in the Dureau with person repeated by ing as scientifically conclusive, have been repeated by abler chemists with the result that totally different con-clusions were reached. Not only did the Refere cussions were reached. Not only did the teleferce Board find that the conclusions drawn in the case of benzoate of soda were entirely wrong, but so did Prof. Lehmann of the University of Wuerzburg and more recently Prof. Schattenfroh of the University of Vienna.

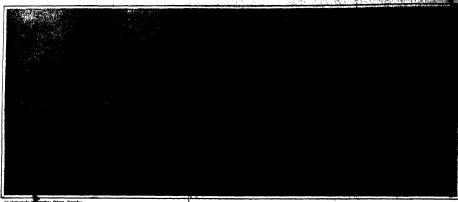
These are scientific men who have reputations to sus-sin Chemists are more likely to accept their statements than those of Dr. Wiley and those who are respon-sible for the benzoate of soda experiments. When Dr. Wiley decided that lead (a cumulative poison) could be safely used in baking powder, he revealed not only his own scientific shortcomings but handed down a ion directly against the spirit of the Pure Food

One of the division chiefs, whom our correspondent regards as a man of high scientific standing, drowned in-stead of poisoning rabbits (as he supposed) by running a tube into their lungs instead of into their stomachs, during the course of experiments intended to show that caffein contained in the quantities found in a popular caffen contained in the quantities found in a popular beverage is highly dangerous. During the same experi-ments rabbits were permitted to contract a contagous mange because the Bureau of Chemistry men had no experience in handling animals. Surely such men are

not competent to conduct research work.

In common with every other fair-minded journal in this country, the SCIENTIFIC AMERICAN regrets the appointment of the Referee Board. But it also recognizes the necessity of that appointment, because the au of Chemistry is either unable or unwilling to act its investigations in a scientific spirit. Had the Bureau done its work well in the first place, we would never have heard of the Referee Board.

Leatly, we have no desire to belittle the work that as Bureau does in conducting routine examinations nat lead to the detection of wood alcohol in extracts the Bureau does in conducting that lead to the detection of wo and boverages or of harmful habit-forming drugs in household remedies. This is scientifically rather unim-portant work. What we expect of the Bureau is not mply analytical work but research of a fine type stermine the physiological effects of substances determine the physiological effects or substances on which there is practically no literature; research, in other words, that involves high experimental ability. That is the most important function of the Bureau, and in the performance of that function it has failed.—EDITOR.



Mersina, port of Adana, where much material for Bagdad Rallway is landed.

THE lines of the Bagdad Railroad hav-ing now been successfully laid from Aleppo castward to the Euphrates valley, calls attention to this daring enterprise which will link Mesopotamia with Europe by an iron road, and, incidentally, the sacred cities of Palestine as well. At the moment an army of 72,000 men are at work upon the railroad, and during the last two years much has certainly been accomplished. Aleppo, in Northern Syria, has been converted into a great railroad-building center. Indeed, it is the principal base of operations, and huge quantities of rail-road material have been collected here. road material have been collected here. Locomotive works and repair shops have been built as well as large temporary bar-racks for the workers. On what is known as the Aleppo section there are now five hospitals with ten doctors and many nurses who attend to all cause of socident and sick ness among the workers free of charge.

This activity on the much-discus undertaking is the more extraordin when it is remembered that from October, when it is remembered that from October, 1904, until the latter part of 1909 not a yard of steel was laid or a spade put into the ground. The reasons for this long dethe ground. The reasons for this long de-lay were certainly many, and to properly appreciate them it is necessary to briefly review the history of the Bagdad enter-prise. It was in January, 1902, that a Franco-German syndicate obtained a con on from the Turkish government to build a railroad from Konia, the terminus of the German Anatolian Railson Minor, to the Persian Gulf, a distance of 1,460 miles, or 1,870 miles from Scutari, the Assatic subury of Constantinople on the other side of the Bosphorus. The work was to occupy eight years, provided the money was forthcoming, and it was estimated that the line would cost about \$100,000,000 to build. It soon leaked out that the syndicate was a group of German financiers. with the result that British statesmen did not regard the enterprise at all favorably, not regard the enterprise at all ravoganty, more particularly as its ultimate object was to tap the Persian Gulf. This was but natural, for eighty-eight per cent of the trade of this region is in the hands of the The British argument was that she had spent blood and treasure freely in opening the Gulf to trade and that the maintenance of British supremacy there was an integral part of her Asiatic policy.

Again, Great Britain recognized that the syndicate, or rather the Germans, had the best of the bargain. Turkey was to find the money and the Germans were to build the railroad with German material to mind the railroad with German material and by German engineers. In 1903 a prac-tical start was made. The Turkish govern-ment handed a loan of \$9,500,000 to the syndicate for the erection of the first section of the road. Instead of costing this sum to build only \$3,000,000 was expended. There was a clear profit on the construc-tion of \$6,500,000. This first section of the

The reign of the Turk in Europe is over. His future lies to the east of the Bosphorus and the Dardanolles, in that land of history and fable which is about to be restored to more than its one-time prosperity by the coming the railroad and the irrigating ditch. Very timely is the following story, by an eye-witness, of the construction of the Bagdad Railway.- Editor.



One of the famous Naupas water-wheels of Hams



Castle at Tripoli, taken after five years, sign by Count Raymond the creation,

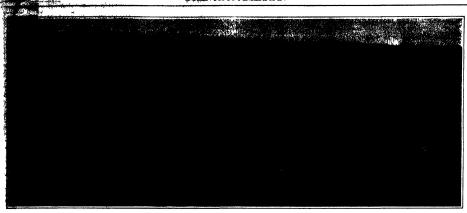
gdad line runs over a dead level plais and crosses only one small river. So con-struction was done as cheaply as it could possibly have been. Section number two, wever, traverses the Taurus Mountains, and it was discovered after careful survey that \$15,000,000 would be needed to carry the rails over this route. The financial the rails over this route. The financial arrangements being the same as before, Turkey was prepared to find \$9,500,000, but this was not sufficient; while it appears that a large proportion of the profits made on the first section had been distributed among the shareholders of the syndicate. The result was several years del The result was several years delay, caused principally through the want of money and also by political and other disturbances in the Turkish Empire, to say nothing of the action of Great Britain in demanding that second of Great Britain in hemanang tank her rights in the Persian Gulf be safe-guarded. The upshot of all these discus-sions was that the Germans not only got over the money difficulty, but obta loans from the Turkish government amounting to \$37,500,000 to enable them to carry on the work over more than one tion at a time, while England was proscoson as a sine, while anguland was pro-visionally satisfied by an arrangement by which the line from Bagdad to the Gulf should be built by an English company and be purely international in manage-

Having briefly outlined the re-Having briedy outlined the reasons for the long delay, let us giance at the work now in hand. The enterprise has been divided into four sections, the first extending from Konla to Adana, the second from Adana to Aleppo, the third from Aleppo to Mosul on the Tigria, and the fourth from Mosul to Bagdad. As alwedy explained, an English company will earry the finer from Bagdad to the Persian Gulf, and this section is to be jurely integrational in its management. To discover how the work management. To encover now the work was progressing, the writer, in company with some photographers of the American Colony in Jerusalem, journeyed north from Cosmy in seriassim, journeyed north it that city to the seat of operations, via Aleppo and tramping esseward over partially completed road toward Ruphristes. We also made excursion Tripoll, Alexandretts and Mersias, ports to which the material for the bull-of the road is housies. Specialon we the the

ports to which the material for the building of the road is brought. Speaking generally, the officials were very retional about giving infoutnation, though no objections were resided to our visiting of the workyards and taking photographs.

Over the three exclanative chiral from Konia to Missai, an army of 72,000 from is at work. From Kenda to the in singuity operand to visible of fair, as Unitability as the very found the Tauring kinning and temping of the Tauring kinning the first fitting of the Tauring kinning the fitting of the temping of the priving as they are the send diverging it down again; into the fielding and the priving of which is sufficient to the control of work. However, possible registeries are grapping with the difficulty of the send of which is discovering against an expension are grapping with the difficulty.

## SCIENTIFIC AMERICAN



Homs, one of the largest cities on the French Beyrout Aleppo Railway The roofs of the houses made of mud and straw The new (French) houses in fore

the next two or three years. There are office particularly deep chasms to be spanned and much blasting away of rocks to provide a bed for the track. Meanwhile to provide a bed for the track Meanwhile the track is being rapidly laid from Adana westward toward the Ciclian Plans as well as eastward in the direction of Aleppo well as eastward in the direction of Aloppo For some months past material for this section of the road has been sent up over the short line from Mersma a small port in the Mediterranean in Asia Minor to Adana. This railroad was built some few years ago by the French but has now been purchased by the Germans.

1 Then from Aloppo the principal base of operations the builders have pushed east-ward toward the Euphrates which has now been reached and northward to Omnativeh on the way to Adana. The

now been reached and northward to Osmaniyeh on the way to Adana. The activity at Aleppo is remarkable. A few years ago it was a sleepy old world Syrian city. Now all is bustle and activity. At

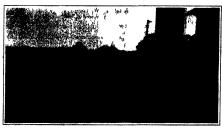


Map showing route of Bagdad Railway

the present time l inding rister il is being brought h re f r the railrad over the Fren h line from Tripoli. Fr m this port Even h line from Tripoli. From this port, as train of twenty to the wint wire care of rainways the twenty with the care of rainways the control of the rose of the wooden bridge over th Luphrates will be put in hand so that the rails may be laid with all poss ble speed to Monsul Much of the embankment along the route here t as been already made. The temporary tridge over the Fuphrat s will be replaced on 18 r 440



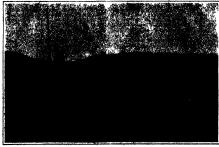
Lumber for the temporary Euphrates bridge. Note fine track



Train from Aleppo arriving at the Home station



The old weir.



A 'dirt train, Bagdad road, near Aleppo.



An oriental double-decker

#### Vacuum Cleaning Attachment for Automobiles

A VACUUM cleaning attachment for automobiles has
A recently been invented. It is operated by the ex-haust gases from the engine by passing them through
a suitably designed nozate and vacuum chamber. The principle of operation may be likened to that of the injector as used with the steam boiler. The exhaust gases create a suction in the hose as they leave the nozzle and pass the opening in the vacuum chamber. Any dirt or dust will be picked up by the cleaning tool or brush and discharged to the atmosphere through the exhaust tube.

The device is installed on the ear in the same man er and place as the ordinary muffler cut-out valve. This is accomplished simply by cutting out a short section of the exhaust pipe ahead of the muffler.

The invention renders it possible to finish a long ay's run over dusty roads clean and free from dust. Clothes as well as the car can be cleaned.

#### Back Rest for Lecomotive Engineers

W IIILE almost everything possible has been done by different rallroads for the benefit of the traveling public, very little thought has been given to the man at the throttle, sitting for hours in a narrow cramped position, his mind taxed to the full limit, his body at a terrible strain. The percentage of deaths from Bright's disease and other kidney disorders is very high among locomotive engineers, and it is claimed that this is due in large measure to the continued jar of the engine With a view to ameliorating these conditions, an inventor hailing from Montgomery, Alabar has invented a portable back rest, a view of which is shown in the accompanying illustration. The back rest is made of canvas, which is attached to the seat, while the upper end is secured to cell springs, which are hooked to the celling of the cab. The springs relieve the engineer of a great deal of jarring, permit him to occupy a much more comfortable position, and consequently make him more efficient, particularly on long The back rest may be rolled up into a small weighing altogether less than a pound and a half The device has already been put to the test of actual service on the Louisville and Nashville Railroad, and has been heartly indorsed by the engineers.

#### A New Slot-machine Camera

THE new automatic photograph machine which we here illustrate is an example of great ingenuity as applied to its conception, as well us a most careful working out of all the details. It is the invention of H. Ashton-Wolff, an electrical engineer, who succeeded in completing it at Parls after many years' work. It is a coin-operated machine which uses electricity throughout, and one of the main points is that instead of the old-fashioned tin-type, it gives an artistic por-trait upon a platino-bromide postal card. It appears that this is the first time that an entirely aut archine is able to make an attractive and durable photograph of this kind, and in fact the new apparatus is attracting much attention and is considered a great advance upon what has been heretofore produced.

In order to take the photograph, the person inserts the proper coin into the slot and from there it drous down behind a small glass screen, where it remains visible during the process, only falling into the cash box when the finished picture is delivered. This is a means of obliging the public to use real colus, for the inserted coin being in plain view is seen by the

bystanders, etc. As the coin is insert-ed the machine starts, a bell rings and a sign becomes luminous containing red cross to fix the attention. Next it is a small mirror arranged like the finder of a camera, which shows the sitter if he is in the center of the sitter if an is in the center of the photograph. Proper directions for this are given in an inscription placed on the machine. An artificial light comes into action as well as a bell and a sec-ond electric sign requesting the sitter ond observe sign requesting the sitter not to move. The exposure, which is instantaneous, takes place, then the light goes out and another imminous sign indicates that the sitter can leave the apparatus and walt for the picture delivered.

After the exposure is made the photograph card drops down into a closed ebonite dish, into which the de considered enourier and, into which the de-veloping solution flows, this coming through shoulte tubes. As soon as the card is developed—and it is to be re-marked that it develops a positive pictime instead of a negative by sivens of new chemical processes which have been discovered after long-research— the developer flows out of the disk into a waste tank below, so that each photograph received fresh bath. "All the photographs and shiften between they are treated thine." October yearness show flow flow the disk in order to shift the spill. After that is then washed and all the d



Vacuum-cleaning an automobile

The exhaust mass of the motor create the suction

ated. The dish in which all these operations take place then opens below, and the finished card drops down into a drying device, which dries the photograph by whirling it centrifugally. This special device is a new invention and dries the picture without softening the gelatine, as is remarked in the case of heat dryers. The photograph is thus dried in fifteen seconds. Elec tromagnets are then brought into play to stop the dryer, and when it is at the full stop it comes into a



Back rest for locomotive engineers

vertical position and the fluished card drops out through a slot and is delivered.;

All the parts of the apparatus are so arranged that should a leak ever occur, the chemicals cannot by any means reach any working parts of the device, but are forced to flow into a protective ebouite tank and from there down into the waste tank.

To bring about all the movements of the electric devices in the proper manner, a rotating contact devices or distributor is used, which is a fixed disk of insulating

rape on derivi A very stoong artificial light of

tined by the use of over-volted. traits on a single charging, nagnet devices con so that there are no springs, came or apparatus. All the photographic so for at least one month. Each of the parts mechanism which can be taken out at for at least one month. Engli; of the parts (spa-mechanism which can be tisses one it is tisses one it is mechanism which can be tisses one is in-write med be detached, as all the contacts med-suring place. About ten spinutes are negle-charging the machine. The value of the appli-increased by the use of spoodal devious for a line result of the part of the application of the signs which can be readily applied in any con-tact. As the photograph comes out, a luminous hand the sitter's attention to a second slot, and dropp cent into it secures a transparent enve

#### An Early Type of Cotton Raised in the United States by the Hopi Indians

THE origin, growth and development of the cotion industry in the United States has received consisterable attention from historians, ethnologists and statisticans. Much interest has been manifested in the identity and description of the varieties which formed identity and description of the varieties which formed the foundation of the American upland cotton, but only recently has there been a systematic study and analysis of the types of plants which make up the field crops to-day, with a view of accomplishing this object. Although it is difficult to ascertain the actual extent

sence of native species of cotton on the charof the influence of native species of cotton on the char-acter of the present-day types, it is fait that they have been influenced more by the importation of troplosic and European cottons than by any "original American ones. With a view of cheidarthia" the listory of one form of native cotton. Mr. Frederick L. Lewton, of the U. S. National Museum, has written a pamphlet centited "The Cotton of the Hopi Indians: A new species of Gossyptum," forming publication No. 2146 of the Smithsonian Miscolaneous Collections. The fact that cotton was used and of necessity cuits.

of the symmonian suscessioneous consecutions.

The fact that cotton was used and of necessity enitivated by the Indians, is recorded by several early Spanish explorers, as it has been more recently by many ethologistis. In the villages of the elift-dwellers of Mess Verde National Park numerous fragments of cost ton cloth have been unearthed, and in Utah the a of the plant itself have been found.

To-day, among the Hopi Indians of Arisons, the cot-ton plant is highly esteemed, and its fiber enters into many of their ceremonies, as well as into many prac-tical household activities. It is considered cessarial by them that all strings employed in religious services be of native cotton. These strings of cotton are used to hind together prayer sticks and offerings of all kinds, and are placed in the trails entering the pueblos where cor services are in progress; the badges of the chiefs are all wrapped with native rough-spun cotton strings; and cotton is also used to weave core-monial kitts, betts and blankets.

Unfortunately the native Hopis, deft in the art of weaving blas mention runs and other articles trip cuiton, now find it far easier to pa chase either the yarn already sputh, the cloth already woven, or the consiste garment, and this the art is gradually being lost. Cotton is still culti-by them, however, to a small so in a village in the Western Mayah

me a village in the Western Mavaje Reservation, and in one of the Model. The Department of Agriculture has carried on experiments with Royal out-ton for the past seven years. This year ticular species of cotton is remarkable for the rapidity with which it grows and the early date at which it grows being the earliest to bloom at hundred species put to be as to bishory and developing

North a service Personalism these distribution the service services the services

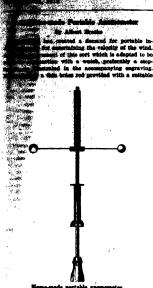




New alot-marks

#### SCIENTYFIC AMERICAN

Salar Sa



handle. The red is divided into three sections; the sec ton nearest the handle is unthreaded, the middle secthon is threaded, and the outer section is graduated, but not threaded. Mounted on the threaded portion is the rotary part, consisting of a nut provided with four nating in small cups after the fashion of the common anemometer. The cups must be so posi-tioned that their convex sides will be in advance as the next follows its spiral course down the rod. The nut earries a sleeve which is of exactly the same length as the graduated portion of the rod, so that when the nut is at the top of the threaded portion, the end of the sod will be just covered by the end of the sleeve. In this position the nut may be held by means of a set sleeve which the operator slides up against it. When It is desired to measure the velocity of the wind, the anemometer is held in such a position that the wind has unhampered access to the cups of the rotary part. the set sleeve is retracted and the anemometer is permitted to revolve and pursue its slow spiral course down the rod. At the end of ten seconds this motion is checked by means of the set sleeve, and then the graduated p ortion of the rod projecting above the the wind in feet per second or miles per hour, depend-ing upon the nature of the graduation. The rod may be graduated by comparing it with a standard anemom-eter or by carrying the instrument on an automobile at eter or by carrying the instr-fixed speed through still air.

## Method of Making Selenium Cells By Philip Edelman

Chenium can now be obtained in fused sticks or plates at about seventy-five cents an ounce. It is regeared from conspounds of selentium which are found, in, the dust from furness fines where sulphides and. Sutting it the namembeture of sulphire and. This is cardinated to selentions acid, which is treated with sulphorous acid, so give selentium. It thus forms a valuable by-preduct of what was once thrown away as makes.

Seismina suists in two allotropic forms, a red amorphisms powder obtained as aboys and a dark gray mass obtained by mealing and sighdenly costing this red powder. In addition to these, orystalline forms are obtaintify in parting the gray solid form of selection in completioned vessels with varying amounts of etc.



4.4

These are usually either white or pink. They may be obtained by lessing a portion of the gray solid selenium in an evaposating disk, covering or partially covering the disk with a clear piece of giass. Care must be taken et else of the giass plate of giass. Care must be taken et else of the giass plate of giass. The crystals form on the giass plate. By varying the opening and supply of air different effects are produced. The red poisonous funes which arise from the melting selenium are air coffids of assential, which may be collected by helding a gight plate at some distance from the evaporating disk, where the vapor condenses on the giass plate. Tattle gray-black globules of selenium collect on the Smiddle of the evaporating disk.

Chemically, selenium sets very much like sulphur. Heat is necessary for nearly all its actions with other

Channicality, assembrum nets every much like anulphur. Head: is neckswary for nearly all its actions with other elements. It lims a very strong affinity for lead, tin, and stand, and when a little of either of these metals is thrown on some medied selentium, some pretty fireworks take pines and a selentile of the metal is formed. Nondifferent selections of the metal is formed. Nongible acids access very energetically upon selentium. The styr solid form is function in carbon disniphide, but the amorphous form is collected in it.

The gray solid form in the only one which is suited for electrical use. As it comes in sticks or plates it has a very high resistance, and is indeed almost an insulator. This is not so strange when we consider its close relation to stick sulphur, sulphur being one of the very best insulators known. Indeed, it was discovered that the resistance of selentium varied with the light to which it was subjected, while it was being used as a resistance for beiggraph work.

resistance for telegraph would be resistance for telegraph who containing a very thin film of selentium on some closely adjacent conducting wires. After countless futile trials the cell shown in the drawing was constructed. Its

the ceit showh in the drawing sec constructed. It is dimensions were I inch by %.

A piece of clear naise % inch wide and I inch long is cut out, and beginning % inch from one end two separate enameled copper wires are closely wound unit within %, lies of the other end. The writer uses No. 40 enameled wire for this purpose, although No. 24 is â. 8. assumeds wire has been used successfully in the same way. The enamel is then very carchilly in the same way. The enamel is then very carchilly are to prevent on the holder and hereaft and prevent of a very line prevent of the copper wire by means of a very line prevent of a very line of the copper wire by means of a very line prevent of the copper wire of the holder and hereaft as one placed one speakers of the holder part is not difficult. The grid is then quickly placed on a smoother holder and a small place of clear gians %, by 1 inch pressed down upon it with heavy pressure. This method insures a very thin dim of section, which will adhere permanently to the grid. It should be so that it is sendit then be taken out and suddenly cooled. The whole operation is a delicate process, but once mastered to the ends of the cells is simple. Connection is made to the ends of the cells is simple. Connection is made to the ends of the two fine wires. The cell should be making of the cells is simple.

monnece so that the night can reach it from all sides.

The cell when constructed will still have considerable resistance, so a battery of a number of cells will be necessary. When proper pains and care are taken a cell sensitive enough for all ordinary experiments will be the result.

#### An Improved Phosphoroscope By Walter C. Belcher

DOSSILLAX no neadly constructed elecutific Instruments will effect, more entertainment than a phonphoroscopie; yet not one instrument maker in fifty
which have what was desired were one ordered from
both. For the substitutes will assign the property of the contraction and will furnish
an sore-entrying display, rivaling an unless variety of
the instruments will assign unless which there
are sere-entrying display, rivaling an unless variety on
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need engose it to depth and then granting it in the dark
order to have the demonstration of the glow is very whort, we
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could be the file this unless an instrument designed for this possible seems at hand. Bouquest's devised such an instrument, consisting of a disme or between the such an instrument, consisting of a disme or between the such as an opening in each and. In this thing, spirites the disks meaned on the same arise and general opening the such as the same number of hills; "Ship the superstand close to the ends of the drum, had she do added that when a hole in one disk is appealed the hole in the corresponding end of the drum, like showed disk closes the hole at its end and vice corres. The object placed in the drum for examination in this majorate is allowed in the drum for examination in this majorate is slight and to the open in as reput specession as may be desired when the axle is revolved. The writer prefers an instrument having only one fixed and one rotating plate, pierced symmetrically with the same number of holes, except that the fixed plate has an additional hole at the same distance from the center as the rest. In this hole is inserted a tube serving as a sight tube, which should be made of sufficient length to allow the eye to focus easily on the object to be examined. A small electric motor direct connected provides a neat way of driving

Connected province a near way or cirving.

One application of this instrument which the writer believes novel is its use either with or without a microscope in the determination of obscure particles in crystalline rocks; and doubtless many other applications would probably be found. Coral, lime, glass, sulpate of online solution, etc. are beaufity objects. A





An improved phosphoroscope.

key to phosphorescence is given in the fact that the "glow" of an object is always the color absorbed when viewed by direct light

## A Finder for a Three-inch Telescope

By Ralph D. Rust

I T often takes considerable time to locate a small object when one is using a high-power eyeptocs. A finder such as deelers self for this purpose offsets the difficulty, but the price is often quite beyond the possibilities of a boyle pocket book. A small telescope can be purchased for two or three dollars, but perhaps one much cheeper and just as efficient may be

found in a second-hand store.

When a suitable glass has been obtained remove the first set of lenses in the eyeplece tube and thus convert the terrestrial telescope into an astronomical one. This will make the instrument from 3 to 6 inches

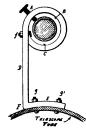
Procure two strips of bress 5/16 Inch wide, 3/22 inch disk and 10 Inches long, six bruss set-screws, and six 3/8 Inch bruss boils. Take one of the strips first; fatten one off it, and bore a boil-hole in it. Measure the distance around finer tube: measure off this distance on the bruss strip starting from the center of the boil-hole, and add enough so that when the ring is made its diameter will be at least ½ inch more than that of the finder. Hend the strip as shown in the drawing, bore a boile at f and secure the ring, with a boilt. Mark off points A, B, and C on the ring at equal intervals, and drill and tap the holes for the set-acrewa. Bend the strip at F. The part I should not be more than 3 or 3½ inches long or it will wibrate too easily. Drill holes at pad g' in the foot B and bend the foot so that it will fit the telescope tube anugly. Bore holes in the sand both from the

in tube and boit the foot as in the drawing.

The second support is made in the same way, except
that the ring need not be so large, for it should fit
over one of the draw pieces of the finder. The rings
of both supports should have their centers in a straight
line marked with the arts of the telescope.

to both supports should have been exceeded a strength. Him parallel with the axis of the telescope.

The finder is adjusted by moving the set-screws about until a distant object in the center of the field of the large telescope appears in the center of the finder field. This device is not expensive and saves considerable time and trouble.



Plader for telescopes

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Another Substitute for Pneumatic Tires

THE effort to find a satisfactory substi-tute for the pneumatic tire has resulted in scores of inventions covering all sorts of combinations of mechanical parts. The principal difficulty with most of these indistribute the shock over the entire wheel as does a pneumatic tire. When the wheel runs over a stone the impact is com runs over a stone the impact is comean-trated upon those parts which are in imme-diate contact with the stone, putting them to such a severe stram that sconer or later they must break. In the case of pneumatic tires, however, the compressed air dis-tributes the load over the entire tubo, so that the whole tire assists in withstanding

Repently a new form of pneumatic tire substitute has made its appearance which depends not on springs or pneumatic plungers, but on the resiliency obtained by pliable bands under tension. With a tire of this sort the blows occasioned by striking a stone are not localized, but are distributed over a third or more of the circumferen-

the wheel, also the tools used in mounting it on or removing it from the rim. Normally when the tire is fully assembled an annular guard plate covers the inner tension band. It will be observed that there are three sets of bands. The outer band has a heavy to give a good tread surface The body of the band, however, consists of layers of specially prepared canvas. A por-tion of this tread surface is shown in the insert in Fig. 1. Riveted to the inner surinsert in Fig. 1. Invoted to the lines sur-face of this band are a number of aluminium cups arranged in pairs. These are adapted to flower aluminium blooks projecting from the intermediate part of the tire. nediate part (see Fig. 3) consists of two ds made up of canvas layers and connested by tubular blocks which are riveted fast. Intermediate of these blocks on the outer band are the aluminium blocks just referred to, which are adapted to fit the cups on the tread band. A similar set of blocks is attached to the inner periphery of the inner canvas band, and these blocks are arranged to enter cups secured to the rim as shown in Fig. 2. The rim is prorim as shown in Fig. 2. The rim is pro-vided with lugs between which these cups are fitted. Each of the cups is formed with a head at one end to prevent it from being displaced endwise from the run. The blocks are alternately disposed as indicated in Fig. 2.

When applying the tire the cups are first When applying the tire the cups are first removed from the rim, then the tire is as-sembled with the tread in place, and is alipped upon the rim of the wheel. This done, every second cup is alid into place, the bands being raised successively by means of a pair of tools, as shown in Fig. 1. The tools consist of flat bars with the ends turned at right angles, so that by slipping the flat side of the bar under the canvas and then turning the bar at right angles, a powerful lifting action may be secured. After every second cup-shaped block has been fitted into place, the intervening blooks are introduced, making the tire ching very tightly to the rim. Now when ffexed, increasing their tension, and, owing ffixed, increasing their tension, and, owing to their resiliency, causing them to yield to a certain extent. The alumnium bear-ing blocks on the middle portion of the tire are cylindrical in form, so that they can turn in the cups and yield in this way to the deformation of the tire. The elasticity of the canvas band causes the tire to return at once to its normal condition on pe

Tiros such as these have already been introduced in England, and they are now being demonstrated in this country. The tire is adapted not only to alleady evenicles.

but to motor trucks as well. In the latter case, however, instead of using canvas bands, the bands are made up of steel links and a heavy rubber block tread surface is

rovided, he ovident that if the bands stretch the slack will immediately be taken up by the weight of the car on the wheels. No

#### New Kind of Eyeglasses Made With Telescopic Lens By Dr. Loonard Konne Hirskberg.

DR. K. L. STOLL, of Cincinnati, has
devised what has proved to be a revolutionary method of correcting poor eyesight.
During the first quarter of the nine-

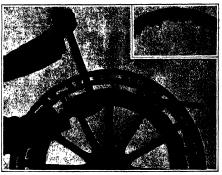


Fig. 1.—Method of introducing the rim cups. The insert shows a part of the tread band with the bearing cups.



Fig. 2.—A portion of the rim, showing two of the bearing cups in



up of canvas bands rivetted to alu-minium blocks.

Eyeglasses with telescopic leases. Magnifled view through telespects.

harm is done by riding with slacked wheels as long as the slackness is kept below a were used for high myopis, or nearness of certain maximum. The tendon of the sight, but their thoory had not been worked bands may be regulated by introducing out mathematically. This was later permits under every oup on the formed by Dr. M. V. Robe, who demonrim and subsequently, if necessary, under that they may be used with advantage.



In near vision the myope with objects closely to the eye is to gain larger image. However, comfortable, for the image. to the eye than the objects in gre the strength of the concave glass nersons prefer to read with ges and a better angle of distinct they are exposed to two dangers; lose their binocular vision or incr tion will asfeguard against the latter ger. The following disadvantages rection with glasses are to be considered rection with glasses are to be conditional.

(i) The susually-worn blooms to glass and not allow correction of astigmation of oblique bundles. As a result of this constant of the condition of t cannot be used for distinct vision. (2) The field of vision will assume a "barrel shaped" field of vision will assume a "barrie khapall" distortion toward the marging of the gleas. This is of very special importance. Fig. 1 shows the picture of a landscape. Only the small central portion is well defined, add the outside is misrepresented. This is held responsible for most pationize to wearing strong concaves. Elevations and vibrating strong concaves. may cause headache, un and disziness.

The operation will eliminate astigmatis of oblique rays and distortion, and will re-duce these two disadvantages in patients are compelled to wear gl

wno are compelled to wear glasses as greatly that they need not be considered. At present, however, after an experience of about twenty years, the operation is con-sidered to be designous and used only in a limited number of osses, especially in those where correction with glasses cannot be obtained.

Nevertheless, the consideration of binoc-

age of the patients, and the existing complications will limit the result of the operation to such an extent that a substitute seems desirable.

The images of objects may be call The images of objects may be calarged by telescopes as the only mean to casable a myopio person to see well at a distance. The weight, reduced field of vision, and clumainess of the glasses, however, limit taket usefulness. A much more perfect instrument is the Pernvohrhille, or telescope spectacles, consisting of a combination of a convex objective with a concave coular. It has to be fitted to each indi-vidual case with special consideration of the turning point of the eye and the at-tempt to produce as large a field as possi-

The e spectacles were applied to a patient, and he was advised to walk toward the Snellen alphabet from a distance at which he could not recognise them until he was close enough to see them distin he was close enough to see them missimony. The letters were hung up in various positions, so as to entirely eliminate the aid of mismary. The light was always the same, and the examination took place each time after an equal adaptation to light, lasting half are less than the control of the

and the examination to light, leasing half an hour. The visual field was taken only in the horizontal meridian, using a large goniometer of five-meter radius, the onate of which the patient had to look at with his head fixed. After this the types (inclinity hooks) were removed to a point where the patient, that likesping his had steady but just moving his oye adoways, could not see them plainly any longer. The latter results were move sestimatery as to vision than these thours in the former. This is counted by the greater, adougned of the method and the types employed.

Beauvith is a phiesipraph of the single-place. They returned one of sestimating appears. They returned one of sestimating supports.

inious.

In constrains it is hoped that with their aid now joints may do gathed for the quadr

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#### s for Investors

states Funn Valve.—In patent No. 1,68 fingh H. Riby of Momphis, shows a piling valve with which respected ouryed vance whose outer he discounted in the same vertical as as the outer periphery of the valve, rises being adapted to rotate the valve in patent of the reciprocated.

A Food Package Made of Cheese. where rectage mans of these.—A warmagh, secured a patent, No. 1,042,119, for any package which is defined as contagn of a small section of choose adapted for retail distribution and a paper wap-per perforated at suitable points to provide vents for the escape of the gases created by the fermentation of the cheese.

Flenograph Improvement.-John H. J. times of New York city has secured tent No. 1,042,110 for an improvement phonographs or similar talking machines in which there is a combined recording weight which may be shifted to and from the head so as to adapt the head for use roducer or as a recorder.

A Neckiese Glass Globe.--In patent No. 1,041,886, to Harry A. Sohnelbach, Craf-ton, Pa., assignor to Jofferson Glass Com-pany, of Follansbee, W. Va., is shown a pany, or rottamboes, w. va., is shown a neckless glass shade or globe with an opening at the top. A separate neck extends through the opening and has its lower end enlarged and is also provided with outwardly extending projections on which the shade rests in such manner as to provide a space between the shade and the neck, the neck having means for en-gagement by the shade-holding devices.

Locating the Source of Sound.—A so-called locophone has been patented, No. 1,035,920, by Frank Della Torre of Baltie, Md., for a method of determining a source of sound wave or of locating a source of sound, and in doing this the waves emanating from such source are divided and the divided parts are compared by bringing first one part and then another through a common conductor. He employs an apparatus including two diametrically opposite receivers, the direction of the source of the sound waves being deterthe source or the sound waves near deter-mined by stopping one of the said receivers, thus indicating into which of the receivers the particular sound wave was received.

Automobile Improvement.-Many roadsters are supplied with a single back seat after the fashion of a rumble. Ordinarily the engine and chassis of this type of machine are adapted to as heavy a load chine are adapted to as heavy a losu as those of a five or six passenger car. It is believed some provision can easily be made to supply seats on opposite sides of the rumble by means of a suitable frame carryrumble by means of a suitable frame carrying the extra seats at its ands and attachable to the single or rumble seat. The
problem will involve seary application and
removal, security when applied, freedom
from rattling when in place and out of
place, and the provision of proper foot-rests
for the occupants of the extra seats.

for the occupants of the extra seats.

Brain of a Patest, Expert.—In a recent publication Dr. Rétward Anthony Spitelas, the brain specialist of Philadelphia, is reported to havbeedided the late Edward H. Knight with having the largest American beats of rescord Mr. Knight was well known, especially in Washington city, where prior to his centry into abe Patent Office he was connected with the office of Munn & Co., and was occupied in the preparation and presention of patent applications. At the same time he was tang, with the preparation of his Mechanical Diston, January 1st, 1872, and semained in santy collect outil "August, 1872, and semained in santy collect outil "August, 1873, Mr. Knight's heals with a weight of 1.814 amplitudes compared well with that of Turgesse, Massach pools and covered, at 2 Coll. strees compared well with that or 1 ur-of, Resear's post and noveles, at 2,012 must, and mid to be the heariest of recmen, and mid to be the heaviest of recand the next beaviest recorded amo-nic and the next beaviest recorded amo-nic bests, that of Gen. B. F. Butler, the resident which is given as 1,758 grammes.

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RECENTLY PATENTED INVENTIONS

These columns are open to all patentees.

The notices are inserted by special arrangement with the inventors. Turns on application to the Advertising Department of the SCHENTIFIC AMERICAN.

#### Pertaining to Apparel.

REMOVABLE HEEL.—L. KALIM, care of Midget Manufacturing (Co., 28 Duans St., Room did, New York, N. This improvement relates to beels for shoes, and an object is to provide a skoo having a repiscable heel of latther, rubber or composition, so that even a preson unsattled is the art may readily remove a worn heel and replace the same by a new one.

#### Of Interest to Parmers.

ROLLER RARROW.—J. E. CARLSON and G. J. NASON, Box 14, Rosedsie Bural, Bakerdeid, Cal. The investment of the Cal. The investment of the Call the Cal

#### Electrical Devices.

Electrical Bevices.

TELEPHONE ATTACHMENT.—D. W. LEP-PRET. 1045 Srd Ave., Manhattan, N. Y., N. Y.

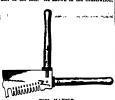
In this case the invention refers to an attach-ment adapted to be secured to a telephone in-strument, so that a strip of writing material, such as paper, can be unrolled, and any con-versation coming over the telephone taken

#### Of General Interest.

or uesseral Enterest.
CURRITIONED HORSENING.—G. E. McK.N.
NON, Little Falls, N. J. This invention com-prises means for cushioning the footfall of the alimal wearing the horseshoe. This end is attained by detachably securing to the under affect of the side of strip of rubber or other suitable material, which forms a resilient tread for the abox. Hardware and Tools

Hardware and Teols.

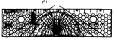
TOOL HANDLE—Acceptine McDenwin, Dem-ing, New Mexico. This invention provides a handle for use on saws and other tools and is arranged to permit the operator conveni-ently to attach the handle to the tool in any position to suit the convenience of the user of the tool. As shown in the lilustration,



TOOL HANDLE

the saw is provided at the end with two handles alike in construction. Each of the handles proper contains a nut segaring a scre-yrod. The flattened end of the rod carries a ing adapted to engage an aperture in the saw. When the handle proper is turned the career rod draws the saw up against a growed bearing mounted on the end of the handle.

nearing mounted on the end of the handle, DRAWING INVESTMENT, J. W. WILLE, (Braymant, III. This instrument permits measuring in degrees an arc of a circle of unknown diamension and whose center is not located i inserves accuracy in arc and angle measurement; measures line segments and radit and expresses their length in a certain exponent; finds the limits of each successive property of the control of the co

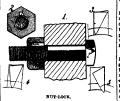


TO A WING THE STREET SCHOOL

compans; analysos may curve into menagrad area and radii for a complete record; uses such record for reproducting segments of curve or symmetrical curves of the same on enlarged or reduced coals; builds complex and compound courves and fagures of straight listes and curves; forms designs companed of size and curves; forms designs companed of size and curves; forms designs companed of size in curve of the same companion of the companion of the companion of the companion of the curve of the curve of the same control of the same control of the same control of the same curve of the same control of the s

shows a free view or two instruments. 2128 W.
16th St., Chinkouna, Ghibi. In side investors a day of nothing theties in strategied to a corresponding the control of the control of the corresponding the control of the corresponding the corresponding the corresponding to the correspo

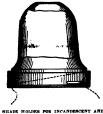
shows an enlarged sectional view representing a nut and bolt and locking device applied as in use. Fig. 2 is a cross section of a bolt and aut showing the dog or locking device in a non-locking position. Figs. 3, 4 and 5 show



discrammatically the different positions of the locking device which is in the form of a soilson triangin, one corner of the base being assume that the control of the soil of the soil

#### Heating and Lighting.

SHADE HOLDER.—HENRY GOODPRIEND, address 124 N. Jefferson Ht., Chicago, Ill. In this patent No. 1.089.519 the invention relates to shade boilers for incandescent and lates to shade holders for incandescent and other immps, and the construction enables the shade to be readily and essaily attached in position with reference to the lamp globe or bulb, and as readily removed therefrom in case of damage or whenever removal is necessary. The improvement securely engages and re-leases a hade by simply turning a ring; there

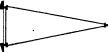


OTHER LAMPS.

are no optings, wires clamps, screws or any parts the madely appearance of servers which are often lost in handling; it prevents breaking of giess y allowing for expansion by heat; it can be stamped out of sheet metal at small variety of dealings; and it may be used to gas as well as on electric futures in upright or in vertical position. A side elevation of the small bolder partty in section is above herewith.

#### Household Utilities.

Econechold Utilities,
CLOTHER LINE HANGES,—L. KALKAMOVITA. 639 Tinton Ave., Redn. N. Y., N. Y.
This device comprises a pair of spaced plates,
a roller journaled between the same and
adapted to have a line pass around it, and
a guide movably mounted relative to the plates,
and adapted to same cicities pins or other
projections or objects on the line, and to guide



CLOTHES LINE HANGES

nd maintain them in darmal needs and makehain them in seemal post pass partly around the hanger, line is supported at the olothes guides. The plan view shows hangers, in use for supporting clothes time. pine by the

clother Rec.

Machines and Mechanism Baytees.

RIFLE PRING DEVICE—J. Levectar

Et. Pistanburg Reside. The invention relates
to improvement in this individual towards
to improve the product of the discretion

The rife is proutited to more in the direction
of the recoil. After which it can be returned
to include the product of the recoil.

is held truly square in initial position by pro-viding on the front supports two parts, of which one above the harrel and gustock is provided with a notch for the bed of back-sight on the barrel and the other part beneath the ride guides a champing ring on the ride.

the rice guides a champing ring on the rine. MULTIFLE, LOOM.—G. GARTRAIL. Paris, France. This invention relates to five improve-ments in multiple looms, whereby sumerous drawbacks in other looms are avoided, so that the simultaneous wearing of two or several pieces of fabric is readered easy and safe, while the examination of the lower pieces of fabric during the work is rendered possible.

fabric during the work is rendered possible.

MACHINE PDR CASTING AND COMPOSING TYPE—F. SCHIMBEL. 103 Rue du Sergent Blandan, Nancy, Meutthe thosels, France. This invention refers to as arrangement of matrices for eating and public bell kinds of machines for catting and composing type one by one, and adapted to permit a mixed composing type one by one, and adapted to permit a mixed composing type of different funts or characters, requiring, as in limitopy machines, a large gaussier of matrices for each font or characters. Requiring, as the finding public districts.

Character
BENDING MACHINE—F. T. Roor, care of
Dedance Machine Works, Tork, Pa. The object
here is to provide a machine arranged to automatically impart a gradual travelling motion
that the state of the state of the state of the
tion to compensate for the increase in laught
of the timber incident to the beading thereof,
thus allowing the timber to but the form very
saugly and thereby insuring the formation of
securately bent timber.

accurately bent fimber.

PACKING MACHINE.—G. H. CADOHERAR,

Ketchikan, Alaska. This device is particularly useful in packing canned goods into case
preparatory to shipment. An object of the
investor is to provide machinery for automatically filling the cases with case, thereby
seconomizing in time in an operation which is
generally performed by hand. The case are
containing the case discharged when the
case becomes filled.

SIPHON FILTER.—J A. Cans, Salida, Colo. Mr. Case's improvement is in siphon filters and has for its object the provision of a mechanism especially designed to thoroughly filter injudies, while at the same time facilitating the withdrawal of the liquid from the eceptacle.

PRINGOIDERY MACHINE.—E. PRIEDMAN, 2885 Fulton St., Hrootlyn, N. T. The laven-tion relates to hand or power embroidery ma-chines having a fabric-carrying frame desped to be shifted according to the dwigs of a pat-tern plate for the needles and thread to pro-duce the destrict embroidery on a piece of fabric The marchine secures accurate aline-ment and stretching of fabric matterial in la-most and stretching of fabric matterial in la-



EMBROIDERY MACHINE.

dividual frames, and exposes only the surface portion of the fabric material to be embroid-ered, thus permitting the accommodation of a factorization of a state of the surface of the at a time. thereby increasing spe output of the machine. The engraving shows a frost eleva-tion of a series of fabric frames mounted on the main frame of the embroidery machine.

Note.—Copies of any of these patents will be furnished by the NCIEMTIFIC AMBRICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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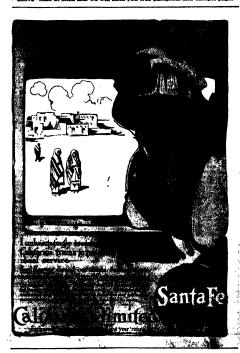
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(Concluded from page 15t.) by a permanent handsome — from and steel which will coverpy to fa strotton. The river here to an wide in fixed time and the current

drette, near the extreme northeast series of that part of the Mediterraness, shall be the Syrian port of the Magdad ralload and the syrian pore or the seguent supposed here.

It is proposed to run the reals from this port to Omnaniyeh on the meta dins. The merchants at Aleppo, however, are endeavoring to induce the Germans to run the line from Alexandretta direct to Aleppo The Germans were to have built a harbo The Germans were to have built a harbor at Alexanderst and collected a large quantity of material her for this purpose. They have now suddenly eased, so far as the far-bor is concerned. Locally, different reasons are given. Some dealers it is for the want of funds, which is not to be credited, for money is being used almost profusely on the main lines. Others say it is because Great Britain has interfered, which is the more probable. No doubt she objects to the Germans establishing themselves on the Mediterranean, and in any near the harbor bids fair to hang fire until case the harbor bids fair to hang fire until a satisfactory understanding with England a satisfactory understanding with England is arrived at Alexandretts, too, is in a marshy locality and suffers from fever, and extensive sanitation is called for to make the place healthy. Just south of Ournaniyeh rise the Amanus mountains and here yen rase the Amanus moduleans and last an army of men have commenced the bor-ing of a six-mile tunnel. The whole of the material in the way of rails, sleepers, stone and iron work for the bridges, lumber for the stations, locomotives and rolling stock is supplied by German manufacturers This is one of the conditions of the concess This is one of the conditions of the consistent and is rigidly enforced by the contractors. Thousands of cars for passengers and freight are now being built in the Fatherland. The passenger cars are to be of the finest kind and include sleeping and dining saloons. All private supplies, too, for the engineers come from Germany. Naturally, the principal engineers are Ger mans, though thousands of Turks are found among the ranks of the laborers.

Taking the route from Scutari to Aleppo

the present gaps do not amount to more than a hundred miles. Yet it is doubtful if a through communication will be possible for another couple of years or more for another couple of years or more. It ail depends upon the success of the engineers in the Taurus Mountains. When the con-nection is at last made the Bagdad Railroad will at once jump into popular promi-nence as affording direct railroad comnemes as affording direct railroad com-munication between Europe and the sacred cities of Palestine as well as with the Euphrates. This will be rendered possible because the Turkish Government has albecause the Turkish Government has already advanced the lines from Damascus to Aleppo. Then from Damascus, railroad connection may be had with Nasarcht and Haifs, and as it is intended to connect Jarusalem with this system the Holy Olfs will also be in railroad touch with Damascus and also with Aleppo in the far north. This will mean that one will be able to journey by rail from the great centers of Europe to Constantinopié fand them scross by farry to the other side, 'and on by train to the eities of Palestin. Ultimassly, how my zerry to the other side, and on by train to the cities of Palestine. Ultimastly, how-ever, it is expected that a heidge will be thrown across the Bosphorous, connecting the Bagdad line with those of Constan-tinople, thus giving a through communicasion with the vast railroad systems of

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and only sparsely inhabited; but in ancient times it was fertile and thickly populated, the seat of an empire that swayed the linet. Not far from Hagdad lie the ruins of ansient Babylon, that mighty city reared by Nebuchadnesser, and it is expected my reducing a season as the expected that many will travel over the milroad to what them. Thus will the Bagdad line being those old Bible cities of Mesopotamia into close communication with Europe as well as the sacred cities of Palestine. Then, n the Gulf is reached, it is but a hand's throw, as distances go, across Persia to India, and it is surely not too much too espect that the Bagdad enterprise, despite all the auxieties it has caused to European statemen, will eventually result in the carrying of the steel rails into that Empire

## Aritient Glass

THE remains of an ancient glass works
of the Roman period which the
French archeologist M. Bauget discovered
near St. Menehould showed many specimear of glass and colored enamels, and from these M. Franchet was able to draw some interesting conclusions. He dis-cusses the two general classes of trans-parent glass and enamels. Many specimens of glass cut into cubes for use as mosaics were found here. As regards the glass, this had about ten different tints, and the colors were obtained mainly with iron oxide for the greens, cobait oxide for the blues and oxide of manganese for the violet shades. A thin layer of hematimon which is a copper red glass is also applied upon clear glass as at the present day. Such glass was used mainly for vessels and bottles, but some very flat glass plates and bottles, but some very nat glass plates were also found. Most remarkable are the enamels used for mossics, and in spite of the lack of means which modern industry gives, the Romans were able to produce series of color shades for the produce series of color snades for the snamels which are most varied. M. Franchet recognised thirteen main colors, giving an ensemble of ninety-eight tones, and the number certainly did not end here. Such enamels he considers as very fine specimens of industry, and he mentions the series of hematinon reds, ob-tained by reducing copper oxide by means of iron protoxide. The autimony yellow enamels, the turquoises which are the most striking of all and are obtained by r oxide dissolved in an alkaline sili copper extue classored in an aixaims sil-cate, the series of greens obtained by mix-ing the turquoise blue with antimony yel-low, were also remarked. The gradation of tones in the same color series vive a perfect regularity and shows great skill a perfect regularity and anows great skill in this art. He considers that the tech-nique of these enamels is clearly of Egyp-tian origin, and that the products closely resemble those which are found in Egypt belonging to the Safte spoch. But these processes appear to have been known in Persia much farther back. The Gallo-Roman products are enamels in the stricsense of the word, and he made experi mts in order to coat them upon potters of the same period, being successful in doing this. It is therefore a matter of surprise that the Romans who showed such great skill in producing enamels, never used these for decorating pottery.

Return of the Swiss Trans-Greenland Expedition

DR. ALFRED DE QUERVAIN and his party of six, who left Diako Island, on the west coast of Greenland, with 28 dogs and 8 sledges on June 10th. succeeded in crossing the inland los and arrived at Angmagailk, on the sent coast, August int, whence they returned to Oopenhagen October 13th. Their route was further north and legace than that followed by Nancon, who made the only provious economic of Greenland in 1888, but much shorter than that to be followed by Kochje expedition, which is now macohing undward from Cupe Hemarch. Dr. die Queerante party raport crossing a rafet follaid inch, covered with thin ion. Nanc the east coast they discovered not an environt is, huma mountained.

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(12701) W. A. B. asks: It is known that the water of the control ask. Will you please state in your Queries and Answers column bed which is common ask. Will you please state in your Queries and Answers column bed to accurate a few ask properties of the cosea and of salt sees does not have a definite proportion of the vestion sales in it, see the same proportion in all parts of the cosea and the same. For this reason we asked to the cosea and the same proportion in all parts of the cosea and of quantities is possible. Indeed, the salts properly profit in prisanting gives a table based upon the samuraption of 35 parts of solid salts in 1,000 parts of see water. This table shows:

							P	arts.
Sodium chloride								
Magnesium chlorid								
Magnesium sulphat								
Calcium sulphate .	٠.						1	260
Potentum sulphate								
Calcium carbonate.		٠.	 				0	123
Magnesium bromid	ø.						0	.076

apanta his time in work connected with science, after is applied services in applied art (12703) N. J. L. anke how to make carcons Rods and Plates. A. Curbon rods and plates of the internation Rods and Plates. A. Curbon rods and plates of the international control of the inter



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The blocks are then turned in the lathe in a similar manner to real meerchaum. Imitation merc-schaum pipes should not be varnished: the var-nish will burn or cruck when the pipes are ensoled. They may be warned and rubbed with a little white wax and then polished with a soft me The best way, however, is to polish them with seventi-ing wooden polishing wheel overed with leather or felt, using dry putty powder or whiting.

lag wooden polishing wheel covered with leather of felt, until grip putty powder or whiting.

(12705) R. L. N. aske how to cloan and brespec booses and trony. A. I. The curations of Engineering the state of the control of the contr

oloth before the fire, but not too close.

(12708) T. M. N. asks for roain for howa, violin. A. 1. For violin roain, boil down Vesice turpentine with a tittle water until a drop, cooled on a piece of glass, is of proper consistency. During the boiling, colid water untel be sadded from time to time. When sufficiently thick, pour into cold water, kneed will, and when cold break into pieces. Zerpose to sun until dry and transparent. A. Bedees the host clear brown roain, must it in a face to the brown roain, must it in a face to the brown roain, must it in a transparent.

J. Sedees the host clear brown roain, must it in a transparent are of the roain of the property of the property

surpression or other robatic dis. Pour in paper mode.

(12707) J. C. sales: Some occumitate claim that the universe began as a cold, nebular vaper, and acquised heat by contraction. How could the demands of the sales with the sales of the sales and saldsided by cold? It is not more reachable to suppose that the universe began in a state of insease heat and is now cooling off; or would the claim that the sales of the sales heat and is now colling off; or would the calc method of the sales heat and is now colling off; or would the calc method that the sales of the sales of

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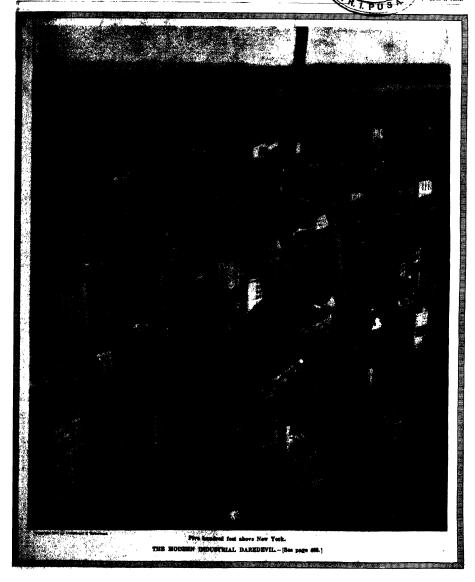
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## SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, NOVEMBER 30, 1912

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The purpose of this fournal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Every Man to His Trade

MONG the various collateral activities of the Navy Department, there is none in white preser efficiency has been shown than in the work of the Hydrographic Office. A most Important publication of the office, which has won world-wide recognition, is the Pilot Chart—to be found in the chart house of every kind of ship that crosses the Atlantic, where it is recognized as one of the most effective safeguards of transathantic travel

The Hydrographic Office at present collects information as to dangers to navigation, treacherous derelicts wrecks, drifting buoys, icebergs, and other matters of vital interest and importance to the mariner. Daily emoranda are issued, giving the positions of all dangers, and this is supplemented by a weekly bulletin containing this information in detail. The Pilot Chart, published at the end of each month, is not only a compendium of all this information, but it contains special articles by skilled officers that afford a fund of information totally inaccessible except through such a long-established and carefully-organized system as characterizes the Hydrographic service. The work of the Hydrographic Office has recently grown to be of such importance to mariners all over the world, that the maritime officials of the European nations have arranged for co-operation for the benefit of all mariners. The agency of wireless information has made the New York branch a sort of clearing house for this information. The system of collection and distribution of news is the most perfect that has ever been devised in the interests of the navigator. The Hydrographic in the interests of the invigator. The Hydrographic Office receives wireless notice from ships at sea of dangers to maxignition, and as promptly disseminates this by telephone, telegraph and wireless. It is the custom for commanders of ships on the day before going to sea, or on the day of sailing, to visit the varito dangers to navigation. In the case of several lines this is done under a positive order from their head

Furthermore, arrangements are being perfected whereby, as soon as notification of any damper on the transatiantic route is received, the news will be transatiuntly route by received, the news will be transatiuted by cable to the Hydrographic Offices in Europe, to be there given to the various shore stations for further transatission to subjudge which is about to depart or bas departed for this sides of the Atlantic The Deutsch Secretary of Germany thought enough of the American Hydrographic Office to request them on at as the headquarters for this service, this office being considered the one bureau best qualified to early it out. It is a cause for gratification to know in what high esteem the office is held both here and in Europe The 1916 of Chart is accepted as accurate, principally because if is prepared by muttend men for mattel and men Thus a Diribia martine officer in the Atlantic Admity of July, 1006, writes. "Suffing ship expirations over many a souring passages to the what and current charts supplied to them. As for me procedual benefit to see forting is and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and away though of the Hydrographic Office is far and the Hydrographic Office in the second of the Hydrographic Office is far and the Hydrographic Office in the Hydr

In view of these facts, the Scatterian America, corrects to begin that a strong offert is nach being under by the Westher Bureau of the Department of variculture to oldstan control of the appropriation for publication of the Public Charts Furthermore, the Weather Bureau staff wish, forgooth, to prepare and pulgish these charts themselves. So far as our investi-

gation has gone, the proposed change is strongly opposed by those very interests—the shipping constitutes and the capitalise of stemships and sailing reselle—for whose guidance the charts are issued. They obtain very properly, as it seems to us—that the compilation of such a purely nautical document should be done by nautical mon possessed of the technical trailing and practical sea-faring experience which are the necessary naulifications for sneeds lowed of this character.

qualifications for special work of this character. Washington is prolifie in boards of investigation, and this matter of the Pilot Charts was made the subject of one of these so recently as March, 1911, when a board composed of Gen. Crosler, Chief of Ordnance, U. S. A.; Mr. Ross, Director of the Burseu of Engraving and Printing; and Mr. Putnam, Commissioner of Lighthouses, reported, after careful consideration, in favor of retaining the publication of the Pilot Charts in the Hydrographic Office.

Far he if from us to say anything derogatory of the work of the Wenther Bursen. It is constantly enlarging the sphere of its operations, and its work is well done; but in proposing to take over from the Navy Department a purely naval publication, the Bursen is showing something of that "vaulting ambition which o'releps tiself." The Agricultural Department has its hands rull in looking after its duties ashore; let it leave muttien matters to those who are technically qualified—particularly where they are as well adminstered as in this matter of the Plott Chart.

Every man to his trade. If the Weather Bureau has anddeuly discovered in their some hitherto unsus-pected qualifications for purely mantical work, why should it stor at the Pitor Charlet N Way should it and assume the work of compiling the Nautical Alumana, now so subject leasts ow we have foundly believed—done by the Naval Observatory? And this suggests astronomy. There may be some subtle relation between the Moon, the Milky Way and the crops; so why not make a clean sweep of it and place the Weather Bureau man at the eyeptace of the telescopes at Mount Wilson Observatory?

#### The "Bath-tub" Decision and the Patent Law

This way the decidion of the United States Supreme Court against the "Bath-tub Trust" is far more important than that handed down in the "Rotary Mimeograph Case," for it not only uphoids the Sherman Anti-Trust Art, but also clearly limits the use which may be made of a patent to control an entire industry. Yet, the decidion is not revolutionary. None of the time-honored privileges of the patentes—among them the right to fix prices and to dictate the manner in which a machine may be used—is curtailed. Nor can the Sherman Anti-Trust Act be evaded by combinations of manufacturers, who disguise themselves as licensess under a nation.

tions or minumeturers, who disguise themselves in the flectuses under a patent.

The full significance of the "Bath tub" decision can be truly appreciated if we contrast it with the Rotary Mimograph case. The A. B blek Company, owners of the nilmegraph patent, and odd their product with the licease restriction that it be used only in connection with link, statuoury and other supplies bought from the patenties. Beyond that there was no attempt to control the industry of manufacturing slughlesting machines, either by the A. B. blek Company or the licease. The situation in the bath-tub case was quite different. The various manufacturers that constituted the Trust agreed under licease prefit close to manufacture bath-tubs and other enameled ware with patented machinery, and to sell their products at a fixed price. Had that price been determined by the owner of the patents, as in the rotary nimeograph case, and had there been combination of licensees under the Dick patents. In the bath-tub case the licensees was absolutely independent of every other lecease under the Dick patents, in the bath-tub case the licensees of the control of the supplies of the product of publics except at a price fixed, not by the trade and competitive conditions, not by the owner of the patents alone, among others not to sell their product of publics except at a price fixed, not by the trade and competitive conditions, not by the owner of the patents alone, and manufacture-licensees. Is it any won-less they entered they could obtain no enameled ware from any manufacture-licensee. Is it any won-der that the Nupreme Court held that the owners of patents cannot employ them to legalize a trust or agree-

The decision does not in the sightest degree take from the owner of a petent any part, of the exclusive rights secured to him under the Constitution and under our patent laws. It holds simply that the owner of a patent is not in any better position to form a trust than any other human heing. If he petent is not a magic clock that protects him from judicial scrutiny. He has the right to control the summitted two, use and usle of his patented inventions; he can dictate the terms of his patented inventions; he can dictate the terms to use his patented inventions; and conditions the right to use his patented machines, even to the extent of compelling the user to purchase from his cerisian patented aupplies needed due see with the sales inche piece es le may endeme he can for the price of patented articipe when soft or sales retail. But further than take he employ applicament must be independent. He saned argument accombination and permit them into a combination and permit them in a ment among themselves to fix the price at which parented article may be said.

#### Technical Questions and the Corone

ORONERS investigations or such disasters in the recent wreck at Westport have too often betrayed evidence of being affected by the poplar prejudice against the railroads. This is atwedeplorable. Moreover, the discovery of the causes as such wrecks involves technical questions with with more often than not the coroner is unfamiliar; at hence, in weighing the conflicting testimony, he is a serious disadvantage.

a serious disadvantage. We commend to the attention of coroners throughout the country the course followed by the coroner who investigated the Westport disaster. To get an intelligent grasp of the problem, and safeguard himself against unconscious partiality, he journeyed far afield, personally inspected crossover conditions on several leading railroads, and consulted living authorities on physics as to the correctness of the theories which had been advanced as to the physical causes of the wreck. Being thus furnished for his tank, it is not surprising that the coroners' report is comprehensive, without him, and distinguished by an unusual grasp of the technical questions involved. The loss of life, he finds, was "cussed by the concurring negligence of the engineer. and by the concurring negligence of the New Hayen Company in allowing its passenger trains to use, at that place, a No. 10 crossover adapted for a safe train speed of 15 to 25 miles per hour only, instead of a No. 90 or other crossover adapted for a safe train speed of 36 to 65 miles per hour.

speed of 35 to 50 miles per hour."

The course followed by the coroner in making a private personal study of the technical aspects of the question is so commendable, that we quote his statement in full: "In order that no injustice be done the New Haven Company by the above statement" (criticism of track conditions by a former employee of the railroad), "I personally visited various track points along the lines of many of the leading railroads.

along the lines of many of the leading ratifoxeds.

for the purpose of investigating track conditions and
to become informed by competent authority as to the
probable influence of such road-bed conditions as existed at Westport to causing describinent at that place."

During his travels the coroner found that on the Pensylvania ratifoxed 50 per cent of the crossovers in use
on its main lines for its high-speed traffic are of the
No 20 type.

From the Engineer of Maintenance of Way and the Assistant Chief Purughtsman of the New Haven Boad the coroner elicited the statement that speeds of 45 and 47 miles an hour (the speed of the deratled train as testified to by witnesses) would be practicable on a No. 20 crossover, and he adds, "in addition to the above, practical railroad men of much experience, to gother with authorities on playies, have advised and convinced me of the feasibility of safely traveling over a No. 20 crossover at an increased speed above that testified to by the witnesses above quoted."

We believe that the impartial attitude of the coroner reflects the spirit of the thinking public. Certainly it is the attitude of the Scravipic Aussican. Although the wreck at Westport could have been avoided by the reconstruction of the crossover, it is not fair to assume or assert, as has been done so freely, that the recent accidents which have occurred on the New Haven Road since the Westport wreck have been due to the poor condition of the tracks. After making a personal examination at the seen of the precent derailment at Green's Farnas, we do not besitate to express our opinion that the accident was due, not as the daily press states, to "rotten ties and poor tracks," but to a minor mishap which night happen on any first-class railroad, The cars left the track at the trailing switch as along the consoiver, it is track at the trailing switch of a short crossover, its incredent was due to a lower consoiver, and the necident was due to a lower consoiver, and the necident was due to a lower than the ties at the scene of the wreck are stramped with the faste of laying. A few were laid is 1905; some in 1910; and the majority in 1911 and 1912. There are tie-platey on every tie, and a substitutions of screw spikes for the old track spikes was in course of being made. The track was in good shape.

Now here was a derailment of a character toolsily.

Now here was a deraliment of a character cotally different from that which happened a few receive heart at Westport. In all probability the fall of this equalizer has be character to proor car impaction; said, if so, the responsibility for the describinent dies at the door of an employee. In the matter of accepting thirty, the describinent differs, from that at jewisteps; which, according to the occurry deding, as specified both to five employee and to the describinent.

chase from him certain both to the employee and to the comprise

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Assertable Telephones in New Realend.—After study-tic thickness systems of America and Europe the first destriction of the Post gad Telegraph Department of New Realend has recommended that a full automatic simpleme system be installed in Auckland, Wellington,

Christehurya, and Dunedin.

German Gendine-sleette Car.—One of the light
malitray lines in Germany in the region of Königeberg, is
making use of a new type of gasoline-electric cas while
is designed by a prominent Berliu electrical firm. It is
fitted with a 4-cylinder 120 horse-power gasoline engine
which is coupled direct to a dynamo giving 200 volts and
250 ampetes. Current from the dynamo runs by way of
a centroller into two 55 horse-power electric motors which
operates on the driving whosels through a speed reduction
genting of 4.3 to 1. The present car takes 100 passengers and weight about 60 tons when fully loaded.

Hydre-electric Station for the Swiss State Railroad. connection with the extensive electric traction proproduces that we determine the control of the section and the section settled in order to make use of water power such as can be obtained from the Rhine, Adige, Rhone and Reuss rivers. Three of the proposed electric plants are to cost no less than \$4,000,000 each, according to estimates, and the total expense in this direction will be \$14,000,000. In this way a large amount of power such as is needed for operating the lines of electric railroad will be secured in various districts.

sten Lamps or Fraud?—The engineer of a fac tory at Duisburg, Germany, was recently hailed to court on the charge of having tampered with his electric meter. The evidence against him was that his bill for current for the year was but 188 marks, as against the 587 marks for the preceding year. The acoused engineer explained that he had substituted metal filament lamps for the that he had substituted metal filament lamps for the carbon lamps and that this had resulted in the saving of 68 per cent. As there was no other evidence against him but that of the bill, the court decided the case in favor of

Velta's Electrical Apparatus Discovered.—In a little old curiosity ahop in a back street of a small Italian town Sir Henry Norman, M.P., recently came across a colleclectrical apparatus constructed by Volta, the Italian pioneer in electrical experiments. According to don Times, which reports the discovery, the uncle of the grandfather of the present owner of the collection was Volta's cook and body servant for thirty years. On the death of the scientist, he left much of his experimen-tal apparatus with his body servant and they have since passed down from generation to generation. The collec-tion comprises a cupboard full of old apparatus, a number of books, portraits, papers and letters and some per-sonal and domestic articles. Sir Henry Norman suggests that the collection be purchased and presented to the Royal Institution to remain alongside Faraday's original

Pensions for Telephone Employees.—The Bell Telephone system has arranged for a fund of ten million dollars to provide pensions, sick benefits, and life meuring the state of the system e for its 175,000 employees. Men over sixty years of age and twenty years in service will retire on a pension, and the company has the option of retiring them at the age of fifty-five. The pension age for women is fifty-five years with the option of retiring them at the age of fifty. The pension will amount to one per cent of the average annual pay for ten years, multiplied by the years of service, and no pension will be less than twenty dollars per month. and no pension will be less than twenty dollars per month. An employee who is totally disabled by accident will receive full pay for thirteen weeks, and half pay until he returns to work up to six years. Sick employees receive thirteen weeks 'full pay and half pay for thirty-nine weeks. In case of death in the performance of work, the heir will heevier insurance equal to three years' pay with a maximum payment of \$5,000. Death from other causes the property of the payment of \$5,000. Death from other causes s insurance in accordance with the years of employ-with a maximum payment of \$2,000.

Beotric Baggage Tracks.—The use of the baggage truck hashedes -pushed by human muscle is being rele-gated to the limbo of out-of-date by certain progressive reliveed and steamable, companies. The new idea is a gated to the limbo of out-of-date by certain progressive relivous and steamably, contiguence. The new idea is a low-deck, heavily built, four-wheel, storage battery driven platform treak which myres the trunks and bage of teavelers in a quantity and at a rate of speed which consists with the modesn transportation of the passen-gers thomselves. One trutk of the new type, operated by the baggage man standing on a small platform at the end, has a rated capacity of 4,000 pounds and is gested for three speeds, the maximum being eight unlier per histir smorts and is ruller new located. These littles the three speeds, the maximum being eight miles per holdr simply and six miles per hour loaded. These little plants of taxaspirtation are Rading zavor also in mail instelling and in commercial wavehouse work. The effi-liatory in handling mail being, the example, is shown by this hold that an electric dysic one nakes five trips with a and of two tens in the tities majested for a hand rouck to salls? Storr trips with a otta-don load; in other terms, a finally effective facility does the week of two and one half hand being the commercial speeds on the salls and the salls and the salls.

precing Blocks of Wood.—A good way to harden ocks of wood used in the laboratory is to boil them in olive oil for about five to ten minutes. Not only ed, but they may be used under water are the docum flarcoened, but they may be used under water as the process makes them waterproof to a great degree. If desired to be used for collecting guees, that is for supporting bell jear under water, they may be made further waterproof by first boiling them in paraffine, then in oilve oil. This makes a wooden block hard and waterproof and every way well adapted for use in pneumatic and process of the pr

An Aretic Tim nderstorm.—A Russian mining engineer describes in Meteorologische Zeitschrift a severe thundescribes in measuronguene Zesteoriyi a severe thin-derstorm far within the Arctic circle. It occurred in Spitzbergen, where the writer was making explorations, on the 13th of last August. The storm lasted about eight hours, with incessant lightning, loud thunder, and avy rain. Contrary to the prevailing behef, thunder-arms are by no means rare in the polar regions, though they are less common there than in lower latitudes. The rm in question, however, appears to have been alto-her exceptional in violence and duration for that part

Crockerland Expedition .- Plans for the exploration of Crockerland have been so far developed by the American Museum of Natural History and the American Geographical Society that it is possible to announce th starting of the expedition from Sydney, Nova Scotta, on July 20th, 1913, under the leadership of Donald B. Mac-Millan, who was a member of the last polar expedition under Admiral Robert F. Peary. Besides exploring Crockerland the expedition will also make scientific observations along the northwestern coast of Grantland and the western coast of Axel Heidberg Land, its work being closely connected with that of the other expeditions n sent out by the Museum of Natural History and the Geographical Society to clear up the prob-lems of those particular regions.

Rubber Plant Oil for Japanese Umbrellas,-The vegetable oil used in making paper umbrellas in Japan is pressed out of the seeds of the rubber plant. This oil is pressed out or the sected of the farmer plant. Into soil is made in the various islands famous for oil and sects from these plants. Sandy ground is favored for the cultivation of the plant and the oil is extracted from the seeds by presses. The yield of seeds is estimated at seeds by presses. The yield of seeds is estimated at twenty bushels per acre. The annual production throughout Japan amounts to 350,000 bushels, from which over a gallon of oil per bushel is extracted. The oil before it is used is boiled and then cooled until it can be applied by hand to umbrellas with a piece of cloth or No machinery or tools are used in applying the When the oiling is completed the umbrellas are exon. What the sum for about five hours. This oil is also used in making the Japanese lanterns, artificial leather, printing ink, lasquer, varmshes, oil paper, and paints.

The Yearly Variation of Atmospheric Electricity.  $-I_{\,b}$  is well known that the electrical potential of the atmospheric phere reaches its maximum in winter, in our latitudes The elaborate observations of potential made during Dr Charcot's last antarctic expedition showed that at l'ort Charcot (65 degrees 4 minutes south) the average potential was 20 volts per meter during the southern winter, and 68 volts per meter during the southern summer. A writer in the Meteorologische Zeitschrift finds that these al results agree with observations elsewhere in the southern hemisphere. It appears, therefore, that the electrical field of the earth is stronger at the time of perihelion than at aphelion. Thus its fluctuation seems to be controlled by cosmical agencies and not by the terrestrial seasons. This conclusion agrees with current views concerning the amission of electrical waves from

Barnard's Observations of Gale's Comet a 1912 .--Prof. Barnard of Yerkes Observatory made a series of photographs of Gale's Comet a 1912, with the Bruce 10inch and 6-inch lenses. His observations are reported in the November, 1912, number of Popular Astronomy. the November, 1912, number of Popular Airmonny, The photographs showed a slender faint tail, whose maximum length was about seven degrees. There was very little change from night to night in the appearance of the tail. But on October 14th the tail was bifurcated at a distance of one half a degree from the head. "One rather remarkable feature about the comet," says Prof. Barnard, "was the persistence of a second very short tail Harnard, "was the porsestence of a second very short tail at a very large angle to the main tail, on the south side of the head." The angle changed, becoming greater in each sudcesding photograph, until in the last negative it was nearly as right singles to the main tail. Prof. Barnard was nearly as right singles to the main tail. Prof. Barmard intends to measure this angle castfully for a study of its changes. "It would seem improbable that the comet's tail had any rotation because this about tail remains persistently on ones side of the tennet throughout the observablent." For a few days a very thin streamer solut ones half a degree long on the north side appeared at a very small angle to the tail. It was visible on October 3rd, 4th, 5th and 7th, in the palese, but was not visible on the 12th and the following dates.

#### Automobile

Hungary Motorizes Postal Service.—By order of the Hungarian Ministry of Commerce six hundred motor vehicles are to be purchased by the postal department. The equipment will include 250 small cars of about 10 horse-power for letter collection, to replace the present motor tricycles and bicycles, 75 combined passenger and parcel 'buses, and 275 delivery wagons of from 16 to 30 horse-power for parcels exclusively.

New World's Record for 1,000 Miles .-- In an official e against time at the Brooklands track in England, a 15.9 horse-power (British R. A. C. rating) Sunboam car established new world's records for all distances above 850 miles The little car made the thousand miles in 13 hours, 8 minutes and 25.1 seconds, an average speed of 76 miles an hour It started the long grand with an average speed of 78 miles and finished with 76.1 miles an hour, during the last hundred miles

Novel Alarm Signal .- A new automobile alarm signal of unusual construction and equally unusual sound has just been invented by an Englishman II consists of a gong placed in proximity to the revolving cooling fan, the blades of which hold small striker arms. By means of a Bowden wire cable the gong can be held against the fan, so that a penetrating but not unpleasant warning sound is introduced. The resulting note is said to be similar to that of a "slip carriage" coming into the railway station.

A Crank With Folding Handle. --A novel type of auto-mobile cranking handle, in which the danger of a "keck" is materially reduced, has just been put on the market The device consists of a folding handle, which, when released by the hand or torn from its grip by a "backfire." jumps into the same plane as the cranking arm, thereby reducing the width of the "danger zone" to one inch, instead of the five mehes swept by a rigid handle. The power needed to throw the handle out of the way is furnished by a stiff spring

Electrics for Theater Demonstrations.- In order to impress the general public with the suitability of electric automobiles for theater parties, one of the New York agencies offered free transportation from home to any the Broadway theaters to bone fide theater parties. A And the Broadway inequests to none not inequer parties. And several tests made by intending purchasers and more curious show-visitors proved that the offer was genuine the agents actually did give the free rides- to the ex-terne satisfaction of their passengers. Although the cost of these trips is a considerable item in the expense account of the agency, it is said that it is the best advertising and publicity that could possibly be obtained.

Novel Armored Tire Appears. - An armored tire which is giving excellent service in trials at present conducted by the Royal Automobile Club of Great Britain is the Stelastic, manufactured in Westminster of the tire resembles the ordinary pneumatic, but in the tread are interwoven a series of spiral springs, which offer an absolutely impenetrable shield to nails, glass and tacks, besides prolonging the life of the tire by reason of their great tensile strength. There are no less than 90,000 of these small springs in a 36×5 tire, and the only thing that can penetrate this armor is a long thin nail (part of a hatpin) entering at just the right angle to shp between the coils of the spring. It is also claimed that the tire does not get heated so quickly, as the steel springs disseminate the heat over a larger area.

Automobile for Town Use.—As a ladies' car for opera-tion by ladies about town, the electric runabout has always been a favorite, although many women operate even large gasoline cars. Attempts are being made, however, to popularize small gas cars among The objection to cranking is removed by self-starting devices. The provision of a popular gas car for operation by a woman will demand the attention of both designer and inventor. It must be graceful and its engine must run smooth, while the engine control and transmi should be effected in the simplest way It would not demand a high-speed capacity, and, if needed, some auxiliary heating devices must be supplied to keep the varmed up so that the starter would operate in the weather A car filling the bill at a reasonable cost should find favor among women.

Substitutes for the Pneumatic Tire.--It is safe to say that no subject has received more careful thought and attention from inventors within the last year than the attention from inventors within the last year than the tire problem. But not one of the scores of recently patented devices is quite equal to the plain artillery wheel fitted with pneumate tire. Most of the devices employ springs to take up the jar between the tire and the axle and use solid rubber or similar material for the actual tread of the tire. Ingenious as many of these schemes are they are bound to be less serviceable than the pneumatic tire due to the number of moving parts which are subject to war and broakage Furthermore, there is a great tendency to rattle and par whenever a small obstruction is met by the tire. So, although the problem of substitute for pnoumatic tires has not been entirely solved, much work is being done and it is apparently only a matter of time until we may expect something even better than the present pneumatic tire.

#### Magnetic Chucks for Machine Tools By Joseph B. Baker

Time saving in manufacturing work is of great importance in the present day of rapid production and high cost of labor, and any device that will cut out the waste of even small amounts of time in a given operation is sure to be adopted by progressive manufacturers. In the machine shop the full economy in the operation of the machine tools is often not brought out by the workman, on account of the time and labor wasted in setting up or "chucking" the work of the A familiar example may be found in the work of the shaper. This tool's efficient work on an from casting or other piece, for example, can not begin until the piece has been secured to the bed of the tool. It uires care to make sure of a firm hold on the piece without buckling or distorting it by too much clamping force, and the piece may be of such size or shape that it cannot be readily held mechanically without leaving the clamp itself in the way of the cutting tool. so that this making ready to do the work is likely to be a tedious and time consuming job out of all proportion to the time required to do the actual work

The magnetic chuck, a recently improved device for holding iron and steel pieces to be machined on sh ers, planers, milling and grinding machines, and other machine-shop tools, is designed to remedy this con-dition, that is, to minimize idle time. The device is given its holding power by colls of insulated wire constituting a winding for generating a magnetic field a the face of the device-a field powerful enough to grip firmly the iron or steel piece simply laid on the face. As applied on grinding machines for grinding flat surfaces the magnetic chuck consists of a flat, horizontal or vertical plate of iron beneath the face of which the winding is arranged so as to give a series of magnet poles in the face. Terminals of the winding are brought out to a variable 1esistance operated by a convenient out to a variable resistance operated by a convenient handle (by which the strength of the magnetism can be controlled by the operator on the machine tool) and to a switch for making the necessary connection with the electric lighting or power circuit of the machine shop

current must, of course, be used to energize the magnetic chuck, and where the shop has alternating current only, it is necessary to provide a small motor generator to transform the current. The series of elecfromagnet poles which are made in the iron bed wher the current is turned on are indicated in the horizonta chuck of this type shown in one of the illustrations This chuck has adjustable end and side stops, raised above the surface of the bed, to help in holding the place by taking the direct strain of the grinding wheel or other cutting tool which would otherwise tend to shift the piece along on the bed. A valuable use of this flat chuck is for the accurate grinding of thin pieces such as dies, knives for woodworking machines gage plates, etc., which could not be held by mechanical clamps without distortion

Rotary chucks are also made especially adapted for holding ball races while being ground to finished size, and for grinding with high precision the pistons of gas line engines and piston rings to fit ring grooves netic chucks may be used in groups, as in holding long pieces on a planer or milling machine or in holding a number of pieces of similar size and shape to be machined at one operation.

A magnetic chuck for practical machine shop use will

inevitable be exposed to careless handling, as by being subjected to a higher volt age than that for which it is designed, and to oll, moisture and mechanical mish andling. and it is neces sary to guard against the grounding of the wire windings on the frame of the machine burning out of the windings Accordingly, the wire is insulated with a moisture proof preparation of pure bestos, which is sufficiently heat-proof to protect the coil



Rotary chucks for facing piston rings and the like with great precision.



Rotary chuck with an auxiliary plate for holding ball races, etc



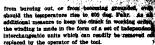
Nine-foot swiveling magnetic chuck for grinding long knives.



Flat magnetic chuck with demagnetizing switch.



Flat chuck measuring 5 by 2 feet and 30-inch rotary chuck for surface grinding



An interesting feature in the practical use agnetic chuck is the demagnetizing switch, magnetic chuck is the demagnetising switch, which is provided to release the work quickly by overcoming idual magnetism.

#### Microscopic Crystal Forms as Suggestions for Designers

ART forms are not produced by nature, for ast and nature are radically different. A natural form may, however, he converted into an art form by a s of selection and transformation which makes it a fitting member of the regular and harmonious com-bination, created by and for the human mind alone, which is called a work of art. The natural forms which the artist finds most inspiring are those which offer the st possibilities of such artistic transformation

In painting and sculpture this process is very com plex, because the artist seeks to produce an illusion (not an imitation) of nature, and also endeavors to create profound mental impressions by harmony of line, mass and color. In applied art it is complicated by the conflict between practical requirements and aesthetic ideals. The process is least complex in decorative art, with its simple laws and limited possibilities

Pure ornament, applied to the decoration of surfaces, is the field of art which is farthest removed from nature and her laws, and which affords the freest play artist's fancy, but it is capable of giving only a vague expression to ideas and moods, except those associated with such of its elements as are manifestly taken directly from nature. The forms suitable for surface decoration comprise abstract and geometrical forms, which depend for their effect entirely upon rhythm of lines and masses, and those natural forms which derive their beauty from superficial contour, pattern and color, in contradistinction to forms unthinkable in tw sions, such as human and animal figures, which appear unnaturally and violently flattened when used as super-ficial ornaments. In many cases the effect of the elementary ornamental forms is subordinated to the effect of a harmonious combination of them, repeated at regular intervals. Textile designs, for example, consist of such recurring groups of subordinated

As decorative art departs so widely from nature, which it merely suggests in some of its lines and forms, until in geometrical designs it becomes the embodiment of an abstract law, the natural forms which it should find the most useful and impiring are those which are produced by natural forces acting in a plane.

produced by hatural rorees acting in a plane.

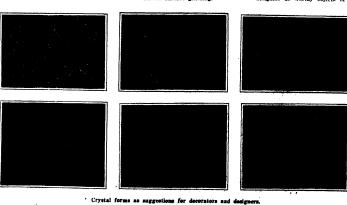
A few such forms are shown in the accompanying illustrations, which represent micro-photographs of nuture crystals, formed by the evaporation of various solutions on microscope sildes. The formation, movements and arrangement of these crystals may be regarded as abstract expressions of natural forces acting the a plane. in a nlane

These crystalline forms are not art forms, as has already been noted, but they present so many points of contact with the art of surface adoriment that it seems proper to recommend them to decorators and as worthy objects of study and probable

> spiration .-Adapted from Prof. K. S. von

A Heat-preof Bronzing Fluid. —Bronzing fluids as ordi-narily made do not stand very high temperathis is desir see the following mixture: Cut "gear var-nish" or any hard vernish with turpentine to the consistency of thin mos, add ten per cent of amyl scotate and att in elemintem powder or a onding po to suft.

and the construction of the



## The Fourth Paris Aviation Salon

## Review of the Show With Mention of the Improvements During the Past Year

FIGURE annual aero show in Paris this year differs.

I from those formerly held in the fact that it was devoted entirely to aviation. There were no dirighties on exhibition, and there were but two ballooms to remind one of the manner in which the air was formerly navigated from the days of Montgolder.

The number of machines on view increased from

The number of machines to try-three last year to seventy-seven this year. Of these, the control of the contro

The most noticeable feature of the show this year was the fact that nearly all the machines are intended for military use. Officers from the various foreign governments were constantly inspecting these machines, and giving orders for considerable numbers of them throughout the two weeks of the show The contests for military sero-lines had in France a view.

ago and in England last September, have brought forth many excellent war machines of a staunchness and stability that could hardly be surpassed. While the mouplane is used chiefly for speed work and secuting, the biplane is also used for the latter purpose and especially for bomb-dropolag, as it is capable of carrying great weights. The monoplane, too, for that matter, has shown lived to have a very high capacity in this

The development of the hydro-aeroplane, or flying boat, as it is now becoming, has been rapid during the past year. Introduced into France last March by Louis Paulhan, when he appeared at the Monaco meet with a Curtbes hydro-aeroplane, these machines have found favor with all aviators, and have increased in considerable numbers. Practically all the well-known manufacturers equily helr monoplanes or biphones with floats for the purpose of converting them into water machines. The next development was the Donnet-Leveque flying boat, in which the monoplane body of a biplane was made to serve as a single step hydroplane, forming a substantal boat, and thus the make

The same of the sa

The D'Artois flying boat and torpedo biplane.

In both biplanes the motor is in the body behind the aviator's seat. In the torpedo the propelled is at extreme rear end of body

shift floats were done away with A large number of flights were made by Lleut. Connecu in one of these machines, and Curtiss is now producing a similar machine in this country. In the Donnet-Lévèque and Curtles friga boats, the motor is placed hist up to-neath the upper plane, and carries the propeller on its enablating that the second consideration and carries the propeller on the DArtois, shown in our Illustration above, the motor is placed in the hull and drives the four-blaided propeller by means of sprockets and chain. This areangement lowers the center of gravity, but does not seem to disturb the stability of the machine, as it has generally been supposed a low center of gravity will do.

constructed along the lines of the Paulhan-Tatin toppede, that was exhibited last year. The motor is piaced in the fuselage behind the aviator's seat, and drives the propeller at the extreme rear end of the fuselage by means of a long shaft Gallindet, in this country, constructed a monoplane for the international cap race along these lines hast surine, but smashed

his machine in its trial flight. He is now working on a hydro-monoplane of the same type, which has been found to be very fast. The D'Artois is the first biplane having the propeller at the rear of the body With a 50 horse-power motor it is said to develop a speed of 65 miles an hour. These machines have another novel feature, namely, the turning of the wings about a central main longitudinal for the transverse stability, in-stead of warping the wings. They were the only example of lateral stability maintained by other means than warping. dence is varied by this method of control, which is the same as was used by Mr Gallaudet on his monoplane men tioned above. Practically all the machines exhibited used for the transverse equilibrium.

There were a number of new devices for automatic stability shown, and models or full-sized machines for their demonstration. The Doutre stabilizer—a vertical plate in

front of the machine which moves according to the variation in pressure and sets the elevator corresponding hospital magnetic states of the control of the control in the set of the control of the set of the Moreau have been detected in the set of the Moreau have been detected with a 70 horse-power motor and an understang car photed to swing and act as a pendulum Messrs. Albert and Amfré Moreau have been developing their "Averstable" for the past ten years, and the latter made successful flighits two years ago in a monoplane having an understang early of the set of the past tend as a pendulum for the party of the set of the past tended as a pendulum for the purpose of setting the elevator. He has flown over 12000 miles shee autil. But in this methels and on



The M horse-power Departments "Monocoque"—th

factor of

1865B.



Salmson parallel-cylinder motor



L'Aviator two-cycle circular motor, which is water



100 horse-power Astra triplace hydro-biplane, winner of St. Malo-Jersey race.

several occasions has flown for ten minutes at a time with his arms folded. On October 15th last, his monoplane carried four men, making a total weight of 1,760 tourids for a surface of 258 square feet. The Moreau machine was the only really new aeroplane on exhibition MM Moreau expect shortly to bring out an automatic device for maintaining the transverse equilibrium as well

Resides the machines above mentioned, the two re-maining features of the show were the "Monocoque" type of monoplane having a cylindrical torpedoshaped body, as shown in the Deperdussin we illustrate and the hydro-aeropianes. The "Monocoque" was developed from the Paulhan-Tatin torpedo, above men tioned. The hodies of these machines are constructed of veneer, tulip wood having been found the best this purpose They are very strong and smooth, and produce very slight resistance because of their shape, and diminished skin friction because of their short Louis Blériot has brought out a machine this type having a half-round body on the under side. He has also changed the undercarriage of his monoplanes so that they now have two wheels with a connecting axle and a central upturned skid. His latest invention is a hydro-pneumatic shock absorber for the central most extending down to the undercarriage

The development of the all-metal aeroplane has been quite rapid during the past year. A half dozen or more constructors exhibited machines made largely of steel tubing and sheet aluminium in the Salon this year. Robert Esnault-Pelteric, it will be remembered, was the first to construct a steel-tube fuselage, and this still used on the R. E. P. monoplanes. firm is now following suit, and also the Clement, and one or two others. Last year the Tubavion all-metal monoplane was the only one of its kind, while this year were several, the chief one being the Haurlot. Leading authorities agree, however, that a proper combination of steel and wood is far more satisfactory than a machine built entirely of metal

The modifications of the various types of aeroplanes on exhibition were slight, with the exception of but two points. First, there has been a general lowering of the center of gravity on many of the aeroplanes, and econd, they have been fitted chiefly with non-lifting In the case of the biplanes, single-surface tails are generally employed instead of double, and only a biplanes are fitted with elevators both fore and There has been a slight endeavor to obtain automatic longitudinal stability by means of wings having a reverse curvature toward the rear, in accordance with Turnbull's experiments repeated latterly by Eiffel The Besson and Bristol (English) monoplanes have such wings. On the whole, however, the curved wing has been displaced by the almost flat wing, having a sharp entering edge in order to reduce the resistance and allow of the highest possible speed being maintained. Speed in itself produces stability, and mo the monoplane constructors, at least, aim to attain the

greatest possible speed.

'When once the need of Europe for war avious is filled, the French and other nations will doubtless turn their activities toward the production of commercial aeroplanes. The hydro-aeroplane, or hydraeroplane has done much toward the commercializing of aviation, and no doubt another year will see many water aero planes in use in the United States, as well as through out Europe.

A very complete description of the most inte machines and motors at the Salon will be found in the CUTTOUT SUPPLEMENT 1996

#### Some Developments in Wireless-II By John Hays Hammond, Jr. neluded from page 488, November 25, 1912.)

#### The Possibilities of Duplex and Quadruplex Wireless.

The development in the immediate future in wireless lines, it seems to me, will closely parallel the ad-vances made in wireless telegraphy and telephony, Facilities to increase the amount of intelligence han-dled will be one of the first developments. Duplex and ultimately quadruplex wireless systems will con into general use. The Marconi Company has already developed a duplex system and is employing it for commercial work. The problem of multiplex wireless telegraphy is again intimately connected with the probctivity; for it is necessary to individualize each individual message so that there shall be no intermixing or interference in simultaneous transmission or

In wireless telephonic work, we may confidently ex-pect a development that will bring it into general use The necessary apparatus will be simplified and made fool-proof to an extent that will allow its use on the farm, in isolated mining camps, and in many places where a line wire connection would mean the expenditure of thousands of dollars. The flexibility of the system, its small initial cost, and the advantage gained n doing away with the need of central stations will ring the wireless telephone into sommercial favor. Greater selectivity along this line is a present day problem and presents greater difficulties than the at-tainment of non-interferability in wireless telegraphy.

High Speed Wireless Telegraphy. Eventually, I believe that it will be possible to de-velop high speed systems of wireless telegraphy for the velop high speed systems of wireless selegraphy for the transmission of news. To-day, we have rapid wire tele-graphs capable of transmitting over wires at the r-markable speed of 5,000 words a minute. Perhaps along lines of chemical research a substance will be found which will change color under the action of minute electrical oscillations. With the discovery of such a suitable substance we could duplicate the rapidity of the Delany system in wireless transmis-

A further important development in electro-magnetic wave signaling is embodied in the inventions of Ernst Ruhmer, of Berlin, and Major Squier, of the United The e two brilliant scientific res evolved the idea simultaneously, but independently, of applying wireless transmission to wires. By utilising the principles of electrical tuning to wire telegraph and telephone systems, it has been found possible to multiplex a line and thus transmit a far greater number of messages simultaneously than can be done with present day installations. The telephone system would benefit materially with the adoption of such a system after it had been perfected, and the increase arrer it and peen persected, and the increased cost of operation would not be, as it is now, proportional to the increased number of subscribers. However, cer-tain essential difficulties still stand in the way of the immediate general adoption of this system, one of which is the effect of forced oscillations produced on the receiving apparatus by the transmitter at the same

Outside of its use as a valuable means to signal through space, the electro-magnetic waves of the future unity space, the electro-magnetic waves or the riture will accomplish results of even greater value to humanity. To-day we are just on the threshold of a great science which Nikola Teals has aptly named "telautomatics."

## Action at a Distance Wirelessly Controlled. Telautomatics is the control of a number of med

isms from a distance with only a single conducting medium, besides the ground, connecting the operator and mechanism operated. The most spectacular branch of this art is in the wireless control of mechanism. of this art is in the wireless control of mechanism. Torpedoes have been guided by wireless. Clocks are being run to-day in Europe by wireless. Bells on buoys have been made to ring from the deck of passing steamers. A railroad locomotive has been operated without an engineer in the cab, and numerous other feats have been performed with only a ground and the ether con-

necting the operator and mechanism operated.

Prof. Ernst Wilson in 1897 controlled a torpedo on the Thames by Hertzian waves. He is the pioneer inventor in this art. Since his time a large number of telautomatic patents have been granted, both here and

This electro-magnetic arm which we can stretch through space, and use to control machinery, is the next great step in the stairway of progress following the aunihilation of distance by the electro-magnetic voice. I believe it will be an important scientific factor in the civilization of the future.

tor in the civilization of the future.
To-day navigation is being safeguarded by the use
of the Bellini Toel system of directive wireless telegraphy. Bellini and Toel nave developed what they
call a Herizian azimuth compass. At a demonstration
with intrument would show within one degree at a distance
of 50 miles the actual direction of reception of a wireless message. This means that when lighthouses are
equipped with wireless plants, it will be possible for
a cubatin to assertian his exert nosition by connertus a captain to ascertain his exact position by comparing the direction of reception of two signals sent from two different lighthouses. The lighthouses will be distinguished from each other by different acoustic

Another important invention is that of R. H. Marriott. atented in 1909. This invention is based upon the fact that sound waves travel at a specific rate through water, and wireless waves travel at such a high velocity that their time of transit from a nearby station is a negligible lapse of time. Mr. Marriott, there-fore, proposes to have a submarine bell sound simultaneously with a wireless signal at a lighthouse or on a ship. The navigator then listens in, and calculates a sulp. The arrigator tent instead in, and calculated the difference in time between the recoption of the bell signal and the reception of the wireless signal. From this difference of time, he immediately knows the exact distance between his vessel and the lighthouse or ship. Thus, in fogs we will be able to navigate, thanks to wireless, with an exact knowledge of our bearings and

wireless, with an exact knowledge of our courage man the distance we are from other remeds.

The transmission of photographs is already an ac-complished fact in wireless, and when television is possible over wires, there is no doubt that we shall be able to see over the edge of the horison by wireless. Prof. Peasenden has shown a matthod of transmitting hundwritten by wireless and there are measurement. handwriting by wireless and there are news

rumors of an Italian system to transmit diswi

military purposes.

The important question is not, what if is now do in the future in wireless, but what is it is to do. Recognic considerations will depend to the future in the future in the future of the consideration of the future of the

to do. Reconcust: considerations will describe the Whatever may be the ultimate developments of whis less, it is evident to-day that we are just estering into a field of science whose attrinsents will have a fau reaching inthence on the shaping of our civilization.

#### The Rediscovery of America

THE Englishwoman who remarked, decopes of sur civil war, that it was no wonder the North and South had become disunited in spirit since they "were only connected by a narrow inthmus," may conceived have been a woman of parts and education according to European standards. American geography hovem on the outskirts of Old World curricula—a thing for the hobby-rider or the advanced specialist. This is true

in whatever sense we use the elastic term "geography."
We believe, however, that dating from the autum
of 1912 our transatiantic brethren will have no excuse whatever for not knowing as much about our country as they knew, for instance, about Turkestan or the Gold Coast. It was an heroic idea on the purt of the American Geographical Society, in commemoration of American teogrammes covery, in commenceaum or its sixtich histhiday, to corral the most eminent geo-graphase and geographical teachers of the Old World, place, them appeard a special train under the strict sur-veillance of Prof. W. M. Davis (a genius at "personal conducting") and a staff of polite but indexible assist ants, and ferce them, whether they would or no, to see about ten times as much of this country as the average enlightened American may hope to see in the course of a lifetime. The Transcontinental Excursion of the American Geographical Society, which began in New York in August and ended in the same city s later, was, in many respects, the most conscientiously executed exploring expedition on record and is certainly likely to be one of the most mor in its results. The journey covered about 18,000 miles including 1,000 miles of automobiling. The country along the route simply turned itself inside out for the benefit of the forty-three foreign visitors. American hospitality outdid itself. Everything that could concetvably interest the foreigners, and possibly much that could not, was trotted out, exhibited, put through its paces. The local magnates, from State governors were on hand at the gates of the cities to bid the visit ors welcome; banquets and receptions filled all the intervals of sight-seeing. The choicest products of every locality visited—fruit, flowers, and what-not were heaped upon the travelers, loads d aboard their train, even sent to their European addresses to await their return. Quite the most remarkable fact in conpection with the trip was that, with one exception, the eans proved physically equal to the strenuous round of sight-seeing and entertainments. The next most remarkable fact was that representatives of thirteen countries spent two months in one another's com mostly in close quarters, without the sligh ach of amicable relations.

Except the last lap of the journey, from Washington New York, the trip was all made on the same train. and only one slight change in the itinerary planned in advance was made consury by the fact that the party was delayed 24 hours at the Roosevelt Dam by an almost unbeard of rain of two inches, which made the mountain roads impassable for automobiles. A daily bulletin, containing the announcements and informs. bulletin, containing the announcements and informa-tion of the day, was printed on the train. A feature of the equipment was a "Guide Book for the Tenneou-thenia Execution of 1912." of 14e pages, complied by Prof. Davis. A well-stocked library was carried along, containing books and maps relating to the region tra-versed. About a doses American geographers made the whole Journey, and some skirty mere accompanied the whole Journey, and some skirty mere accompanied the party in relays as guides to the especticon. The enter-prise was adapted by ospanised from beginning to end. It is each to assect that the class rooms and lecture halls of Rugope will for some time to come be the dis-tributing 'explanation' of accurate, finel-hand information about the once seves second-see, America.

#### Sugar Rosts in Dutch East Indies.

A 1808T interesting experiment in the cultivation of August beets has recently been made near Batu in Malang, Juya, at an altitude of 2,600 feet above one Makang, Jere, at an altitude of 2,800 feet above sen-level. The best ware grown from sent windsteel from Referst in Genmany, and work a great uncossis, weigh-ing on an average from two thirds of a possist of pround, without the horses. Want is much bestder dean those grown in Burope, The content of requir whe 154 per-cent, whoreas in Enterpose the average in less. Associating in a selection companion the production of couper pas case would be 25% things use great page in Burope.

this means suggest the possibility of many the the Philippines and other asset

## **Correspondence**

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tire are not responsible for sta stone cannot be considered, but the name

#### Water Propellers for Ships

Tobserve in SCIENTIFIC AMERICAN:

Lobserve in SCIENTIFIC AMERICAN of September 21st—

Se most interesting and instructive paper that as I think

give exists—you mention under the heading of "Auxil
ley Salling Schooners" the amenation To the Editor of the SCHEREIPIC AMERICAN:

say easies—you mention under the nesting or "Auxil-flay Saling Schooners" the suggestion that they should be equipped with auxiliary engines.

Will you permit me to suggest that it might be worth the consideration of the owners of such vessels, whether use consequenced or no owners such reasest, whether they might not advantageously adopt the water pro-polier. Your readers will no doubt be aware that the water propeller has great advantages over the screw in regard to seconomy, as its action on the ship takes imme-diate effect, and there is none of that waste through the disto effect, and there is none of that waste through the screw requiring to be revolved up to the then speed of the vessel before the auxiliary takes effect. The water propeller was tried during the sixties, prob-sbly in the year 1864. The only fair trial that it had, as I thought at the

he only fair trial that it had, as a thought we, was in the case of three gunbosts, the "Vixen," ipper" and "Waterwitch." The vessels were, I will have and in power exerted. "Vixen" "Viper" and "Waterwitch." The vessels were, I be-leve, identies in form and in power exerted. "Vitens" and "Viper" were knows, the "Waterwitch" had the water propeller. The result showed that there was prac-ically no difference in speed; and it should be remem-bered that no sufficient trials were ever made to asser-tant the best position and mode of exit of the water. The headdness of this propeller for starting ahead, stopping, and ongis astern was greatly superior. The tesuable with the screw having to be feathered is avoided. The motion of the centrifuzza bumping engine, asting

tecume with the screw having to be feathered is avoided. The motion of the centriqual pumping engine, acting like a great gyroscope, tended to steady the ship. I should add that a rough estimate was made, when an ironaled was rammed in the Irish Channel and sank in

a little over an hour, many years ago, as to the amount of water that was likely to have come into the ship, and it was found that if she had had a water propeller, the amount that came in through the hole would only have

en sufficient to give her three quarters sp. Talmer Slough, England. J. J. NUTTALL.

#### Non-astringent Persimmor

To the Editor of the Scientific American: In the issue of October 26th of the Scientific Ameri-CAN I notice an article on "Non-astringent Persimmons." In this connection I wish to state that I have bought at fruit stands in a number of Florida towns, during s rrut season in a number or riorious towns, nuring a num-ber of years past, a variety of Japanese persimmon locally known as "apple persimmon," which is so called on ac-count of the fact that, when taken from the tree, this partoular variety is free of all tendency to pucker, and can be eaten at once just as would an apple. Whon picked ripe, it is firm and fully colored, good flavored and sweet, and decidedly pleasant to the taste. When bitten, the bite comes out with a crisp snap.

I at one time lived next door to a man who grew som iety of persimmons in his yard, and know they were treated in no way to give them the qualities

Tampa, Fla.

#### Ocean Currents

To the Editor of the SCIENTIFIC AMERICAN: About the time the "Titanic" was sunk, I read an article in your paper in which the Labrador current was alluded to in terms which seemed to indicate that its cause or origin was obscure or unknown.

Looking the matter up in several encyclopedias since, find that there is an almost total lack of definite inforon as to any of the ocean currents, including the Gulf Stream.

Griff Stream. For many years I have had the idea that the Gulf Stream, as withan the coean currents of the eastern hemisphers, were the results of the inertia of the waters of the ceeans against the rotation of the earth, piling up comous masses of water against the ceatern shores of both homispheres, and flowing away, on lines of least resistance.

A casual study of the streams from this viewpoint will, Igan sure, make my idea partestly plain, and, considered in connection with the heat at the equator and the cold at the poles, provide an accurate determination of the

at the poles, provide an assumate determination of the scorpe, direction, and effect of every summent in the seas. This idea may not be new, for, as stated above. I have held it for a long time, but certainly such sucrees of infor-mation as have been available to me recently do not spatter any definite idea of the easies. If there is any newlyter or value in this suggestion, please give its oyour saidless; otherwise, please deathery this letter and kindly differs the to some suitable writings on the subject.

A STATE OF THE STA

Solving the Christmas Gift Problem LARGE manufacturer recently wrote us as fol-

"We send out Christmas presents to some of our customers. Suppose we sent you from twenty to fifty subscriptions, what is the lowest price you could make 114 "

We replied to our correspondent's letter and quoted a special price. The following extract tells the story. "Go ahead and have one hundred and fitty cards printed reading as follows.

> We take much planner in abouting you that the Scientific American util he sent to your abbress buring the coming year,

Our correspondent is not only saved the worry and bother of attending to the details of having the gifts delivered at the proper time, but the arrival of the to recall to the minds of the recipients pleasant memories of the donor.

If it is your practice to give Christmas presents to your customers or employees, a year's subscription for Scientific American, or a copy of the "Scientific American Reference Book," or better still, both in combination, makes an ideal gift, that is of permanent value to the recipient.

#### A Promise Unfulfilled

To the Editor of the SCIENTIFIC AMERICAN

I cannot help from feeling that it is my duty to express myself along the lines of thought you conveyed so accurately to the scientific and literary world in your paper published September 21st, 1912.

This subject, "A Promise Unfulfilled," dealing with merics's slow advancement in sero-navigation, is a serious subject, and the causes are just as you say, "Mornational than individual." I have always thought that large or good-sized cities were the places to organize and get money for this work. This may be so in the North, but it has not been so in this part of the South, and to illustrate to you that what I say is true, the following outline should be convincing:

A little over two years ago two men started actual work on this subject in one part of this city. About the same time two other men started work along the same subject in another part of the city. Now, I am in a po tion to know that not a single man of the four had a minention of building a fying machine, jumping into it, and flying off, as 'tis the dream of so many people; for they all knew that experimenting, studying, and hard sucy as znew max experimenting, studying, and hard work were necessary first. There was little capital available among the four men, but by two men devoting their entire time and using to good advantage the little money they lad, flying models and gliders were conmoney they said, flying models and gidders were observeded; laker the experimenters consolidated, and large machines were constructed. One machine was fitted up with a 50 horse-power Bunck motor, and with this machine the zone made use of such experiences as they could get travelling and falling around on the ground. No attempt was made to fly, and "Why not?" was explained to a number of populs.

Soon the time came to do more. Large, up-to-date nes were constructed of the best material and workmanship available (following plans obtained from a northern concern). To install in one of these machines shern concern). To install in one of these machines cap motor would have been foolish, and to buy a good motor the sum of \$225 more than what they had on ary. They tried to raise this amount Every poor man and rich man was cornered; here. Every poor man and rien man was cornered; they had material on hand worth four times \$225, and this was offsced for collateral but they were still unable to raise the required sum here. I will say, just here, that this city has about forty thousand inhabitants, a number of whom are of considerable wealth: it is a city of self-pride and enthusiasm; and a boaster of its place in history. No one was asked to give the money away, but nevertheless on no condition could the \$225 be obtained for the purpose of experiments in acro-naviga-

About 21 miles from this city there lies a little town of About 21 miles from this city there lies a little town of about four theomand people, that is called by some people here a country town. Regardies of what it is called, right in the town of Gastonia, N. C., they obtained the \$225 and a little more to carry on their work. A \$1,200 Maxl motor was ordered at once. What Ansekée needs along the line of preparing a ma-chine or scientific article for the market is a little more of the German swirt. He overainze a commany first for

of the German spirit. He organizes a company first for or the terminal spirit. The organizes a company live for the purpose of experimenting with the articles. The Germans have confidence in what they are doing, they expect results, and they get good results. This nation as a whole title to get rich too quick. When your compare this nation's strength in aviation

to that of a single foreign nation, by representing that foreign nation's strength as the largest flying machine and this nation's strength as a tiny butterfly, every true born American should fell ashamed. Flying machines may seem foolish to a lot of people; but when one reads in the daily newspapers of what the machines have done in time of war, one should stop to think what this nation could do in time of war. They should know that most of the foreign countries are prepared to fight with the help of air souts, while we are not

Patience and a little more confidence will bring results. especially in a country which is the birthplace of the men who traveled long and hard roads to give this nation as well as to the rest of a world a concrete foundation on which rests the successful flying machine.

Charlotte, N. C. A M. WERR.

#### Automobile Toll Roads

To the Editor of the SCIENTIFIC AMERICAN
If charters were granted by States to corporations

for the purpose of building important State and interstate roads for the exclusive use of rubber-tired motor-driven vehicles, the plan would, I believe, be the best way to secure a good many economically built and carefully kept roads.

For such a road to pay dividends it would have For such a road to pay dividence it would neve to have easy grades and as smooth a surface as could be possibly maintained. Such a road would make possible the use of chose automobiles, which would be used in great numbers if only proper roads were built for them.

in great tumbers if only proper roads wore built for them.
The corporation could keep motor buses and trucks
for having passengers and freight on such roads for
the benefit of the public as well as the corporation, all
valueles to have the same rights on the road.
All valueles being rubber trurd and motor driven
would probably not be so wearing on the road as where
rabber-tured and irroat-tired vehicles are used on the

rance-treed and iron-treed veniences are used on the same road. Such a road should not cross public high-ways at the same level, but go over or under them, not only for safety but also for the purpose of easy collection of tolls. Tolls could be collected in this man-ner station agents could be kept at intervals of from four to six miles along the road, where automobiles could be allowed to go on or off the road.

Parties taking an automobile on a road at a station rould have to purchase a tacket, and when arriving at the station which the ticket called for, they would have to deliver the ticket and the agent would permit them to leave the road.

In support of the automobile tell road idea I will fer to the great railroad systems of this country, we they have contributed so much to the development of the country under corporation management, how competition has stimulated inventions that have im-proved and cheapened transportation.

same thing would happen if automobile toll roads were constructed and managed by corporations. Efficient work would be done in construction and maintenance; competition would stimulate experiment and invention, and the result would be of great benefit without in any way interfering with present public roads, but rather stimulating the building and improv-

No considerable number of citizens would care to advocate public ownership of railways, the only general desire has been for some form of just regulation. This being the case, why not have automobile toll roads, built by corporations, between important cities and towns, instead of having such roads built in a hap-hazard way by counties, at great cost and with no visions for maintenance.

CLIPTON R STREET

#### The Gyroscopic Torque of a Rotating Body

To the Editor of the Scientific American.

Apropos of Sir Hiram Maxim's suggestion, in your issue of October 26th, to determine by a special research the gyroscopic torque of a rotating body, permit me to say that the required value of the torque can be to say that the required value of the torque can be found by use of the simple method and well-known formula published in the Schentific American Suppressive March 2nd, 1912 Sir Hiram's proposed apparatus should, of course, yield correct results, but since these can be accurately forefold by computation, the suggested research would at best merely verify a well-established and very reliable theorem in mechanics.

well-established and very reliable theorem in mechanics.
Every engineering student learns how to find the
moment of meria of a body, say of a propeller with
reference to its axis. Multiplying this quantity by the
speed of rotation times the speed of deviation of axial
disastion gives the renuired gyroscopic terque. Thus, starting with a familiar physical quantity, the required torque is found by simple arithmetic

But, though the computation is so easy, the amateur may very well engage for a few moments some com-petent person to teach that to perform it correctly. After that he can figure the gyroscopic force of his clear estimate of its disturbing effect.

Washington, D. C.

A. F. Zahm.

Atlanta Ga.

#### Asphalt Still a Mysterious Material By Newton Forest

N OT long since, while walking, along one of the streets of the National Capital, I came to a section which had been form up and was being repared with nice new asphalt. As the workman with their hage-soled shows sourried about monothing out the hot, smoking stuff preparatory to the assum-roller's finishing touches, the thought came, "What a marvedous material this is," and I stopped to watch the process. Then I began to search my brain for what I knew about this mysterious material now so generally used. It was soon discovered that I knew little of its history and less about just what it is, so I atrakhitway started or "course in aphalti." There are hundreds of thousands of people who each day pass across streets being paved with asphalt, and like I have done many times, give no more thought to the matter other than the street is being paved, and there is a sign standing in it bear-

ing these words of warning: "DANGER! Look Out for the Steam Roller."

Asphalt as a solid bitu-men has lots of history relating to it. The word The word a generic term for a class of minerals, occurring in nature, which are soluble in chloroform and other neutral liquids. They all consist of compounds of carbon and hydrogen, but often contain compounds of nitrogen, sulphur and oxygen also, and in the solid form iron and alu-mina While bitumen may mina be gaseous, liquid or solid, and relatively pure or mixed with solid materials form rocks, all asphalts belong to the solid forms The process by which bitu-mens are formed in nature is still unsettled by geolo gists or chemists, but that organic matter enters into the process is generally ad-mitted, but how, is a technical problem yet unsolved

Asphalt was used by the ancients, but not for street paving. Who first suggested asphalt as paving material is not definitely known. In the valley of the Rhone, in Trinidad, and in California, it had been observed that fragments of the bitumen that were joited from carts were crushed and compacted into a solid rock bed by the wheels of the carts that followed, and the conviction that rondbeds could be constructed of the same material was inevitable. Some time about 1840 attempts were made to pave a street in Paris with asphalt mixed with quartz, and upon a bed of one, but the experi ment proved a failure, due to the preparation and in the method of laying it and

in the combination selected. Not being discouraged, however, the deduction being drawn that the defect arose not in the asphalinself, experiments were continued to larist until a satisfactory mixture was discovered, after which asphalists
became known in London and many other European
cities. The first asphalit street laid in the United States
is claimed by Newark, New Jersey. This was in 1870,
and the material came from the lake in Tridied.

Initing Rible times and the pre-Christian era in general, asphalt was used almost altogether as a cement, and with very little alteration from the form in which nature supplied it. The ancients used it in the remarkable preservative methods that have brought down to us so curiously intext the emislated dead of Egypt Asphalt was used in the construction of the princes of Ninevan and Boshon, and even in the Tower of blade it played an important part. The advantages of bitmen appear to have been entirely neglected or foresoften during the Middle Ages, and the substands

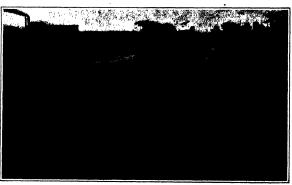
#### The Industrial Daredevil By P. Harvey Middleton

THE tall building has brought with it the need of a peculiar type of human being—a man who, perched on some fitner seat are hundred feet in the air, survey the parenent below with the same equantinity as if he were standing in a first-story window. He is the man who not only builded the skyracrape, but who paints its flagstaff when it is finished, and washes its windows.

Whenever it becomes necessary to touch up the pinnucle of some dome which gilters a few hundred feet from the sidewalk, or to paint with a new coat a flagstaff which seems no larger than a toothpick to the man on the sidewalk, the newspapers invariably devote a column of space to the fearless man who accomplishes the feat. The Metropolitar Tower, which ranks as next to the tallest building of the world, gives ample opportunity for such outbursts of enthudsam. Its

m standing in it bear—opportunity for such outbursts of enthusiasm. Its is much too windy to p

Mining asphalt at Trinidad, which means simply the picking up of the material and loading it in cars. The supply is never exhausted, the deposit renewing itself by natural pressure from below as fast as it is removed.



Asphalt Lake at Trinidad, whose bottom has never actually been reached, although believed to be something over one hundred feet below the surface. Method of loosening up the material for loading in cars for transport to nearby wharf.

lanters and hell must be touched up now and then, regardless of the fact that it is seven hundred and fifty feet from the sidewalk. Below the lantern is a balcomy. To gilde up from it to the lantern is a task calculated to strike terror to the heart of the average human being. The last man who performed the task of regiding the globe on top of the lantern outdid anything that had ever been attempted before. The superintendent of the Metropolitan Tower stood aghast when he saw the man Mortill calmly perched out the shoulders of a nother, just as if the three were performing feats on the comfortable carpet of a vaudorille stage—this sawen handed-odd feet in the air, with a still breess

A steeple jack who paints glided bells at dixry heights is only one of the many thousands of industrial daredevils. Merrill is just one of many thousands of the industrial daredevils who daily risk their lives in helping to build or to maintain the mighty structures going up into the air or down into the earth of New Tork and where new buildings are being constructed at the red (250,000,000 annually. Tunkeds in secondaries with the traction facilities of the city that are airwain; see attracted, airmost completed, and editeably aprend appearance to \$220,007,072. To this can be added \$500,250,000 for river tunnels connecting contains parameter traffic with the city's traction lines, to say nonlines at the fact that New York has \$140,000,000 lavested in forty-five bridges over navigates streams.

Go up some day—if you have the serve—through the many foors of some giant building in course of servition, and watch the groups of braway from workers unconcernedly munching their luncheous hundries are feet in the six, astraddee of naked beams. When the mid-day meal is over, these serial workers still have some time on their hands, and as it is far too much trouble to go all the way down to the street, crap shociing is indulged in singut the great iron giftses—for it is much fee windy to play cards | A good deal of mosony

changes hands in these mid-sir games, for these men who risk life and limb for five dollars a day, are gamblers almost to a man

It used to be said that every floor of a skyscraper cost a life, but it is not quite so bad as that now-Yet out of three adays. thousand men engaged in structural work, six hun-dred and thirteen were either killed or injured in four and a half years. Oclonally you will look up and see a mun sitting stride a cornice bracket sticking out from the twenty-fifth floor of a new building. It looks extremely perilous, but accidents seldom happen that way. More mishaps result from the slipping of a wrench than from any other cause. A man is compelled to use his wrench to pry a heavy col-umn or girder. He puts his whole weight against it, it slips, and down he goes to his death.

Another writer of overgdependent of the "and he,"
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under our river. He
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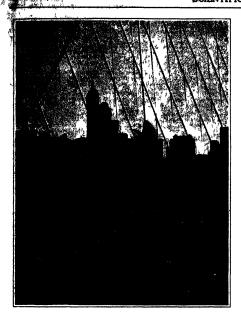
That we have made some progress in protecting our workmen, however, is evi-

dant by the fact that in the building of New York's very latest Frère crossing, Manhattan Bridge, only five men were killed. Two of this number, both riveters, fell into the river, one hundred and fifty-five feet below. Two others fell on shore—one hundred and twenty-five feet to the street.

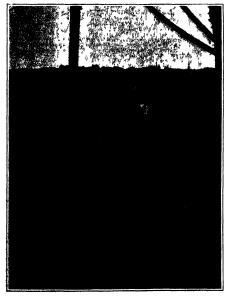
#### The International Federation of Expositions

A CONGRIBSS of a diplomatic character representing to the control of the control

grafish, <del>que desde</del>r. Para la companya de la companya de



Painting the suspenders of the Brooklyn Bridge.



Sandhogs emerging from an air lock



Photographs supprighted 1918 by Underwood & Underwood

One of the numerous perils of bridge building.

Steeplejack crawling up between two targe smokestacks on a power house

## The Heavens in December

## Three Comets Now Visible; Directions for Finding the Planet Neptune

By Henry Norris Russell, Ph.D.

THREE comets are now visible in various parts of the heavens, but only with telescopic aid. Gale's comet is still in view in the northern sky, though being in almost the same right ascension as the Sun, it can only be seen just after dark or before dawn. Schaumasse's comet, discovered at Nice last month, has moved very rapidly southward, but is still accessible

to observers on the other side of the equa-tor; and a third comet, discovered by Borrolly at Marseilles on November 2d. is visible in the evening sky, its position on December 1st being roughly in 20 hours 10 minutes it A. and I degree north declina-tion (which puts it not far from Theia Aquibe), while its daily motion is about 1% degrees toward the southeast. in November it was visible in an opera ss, but it is receding from the Earth and Sun and growing fainter.

It is to be regretted that more specific instructions for fluding this and other maricetons not be given in such articles as the present. The reason for this is that the ephemerides, or predictions of a conec's motion, which are published shortly after its discovery, are purposely made to cover an interval of only a couple of weeks, after which a more accurate cal-

cubation of the orbit is made, and a new ephemeris prepared for another month or so, and so on. When these ephemerides appear in foreign publications, they will often have more than half run out before they reach American readers Except for objects of special inter est (such as Halley's comet) the average astronomer has usually at his disposal only predictions that run on for a fortnight or so; and hence articles like the present, which must go to press nearly six weeks be-fore the end of the month with which they deal, cannot give all the information that their writer might wish, for the labor of calculating the comet's motion for this especial purpose would be prohibitive.

These three comets have come almost simultaneously,

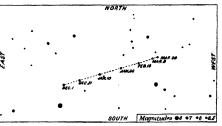
after a long barren interval.

Gaie's comet passing peri-helion on October 5th, Borrelly's on the 20th, and Schaumasse's on the 25th All three are now growing inter, and none of them will be conspicuous.

Schaumasse's comet is, however, of a good deal of interest for an even as the orbit was roughly computed it was seen that it was moving in a path very similar to that of a well-known periodic comet-Tuttle's-which last appeared in 1899 But, according to the orbit computed this comet was not due to return until January, 1914 Fayet, a colleague of the discoverer of the comet on its present return, has however made a preliminary calculation of the motion of Tuttle's comet since 1890, and has found that toward the end of 1900 it passed within 70 million miles of Jupiter, whose attraction considerably modi fied its period, and accelerated its return by three

According to those calcu lations the comet should have returned to perihelion on October 9th, while Schaumasse's comet was there on October 25th. Only the most important part of the long calculations has yet yers probable that when the action of Jupiter has been more precisely computed, the observed and calculated times of the comet's return will agree exactly.

This comet is of interest on account of its period-18½ years—intermediate between the numerous group with periods varying from five to seven years and the longer periods like that of Halley's comet, and also because of the high inclination of its orbit plane—54½ rees. Its least distance from the Sun is 95,000,000 s, and its greatest 970,000,000—rather more than



Path of Neptune, 1912-1913.

that of Saturn. Its orbit passes within about 7,000,000 miles of that of the Earth, near the point of the latter occupied by us on December 21st. If it had not been influenced by Jupiter, but had returned to perihelion in January, it would have passed very near us, and been a conspicuous object for a few days. As things actually were, its least distance from us was about 100 million miles.

In response to several inquiries we give this month a diagram for the purpose of enabling observers who Dossens small telescopes to find the planet Neptune.
Though Neptune does not come into opposition until January, he is so far north that he is well observable in the latter and the second sec in the latter part of the evening all through December,

path, covering an area 2 degrees by 3 degr path, covering an area sequence by 3, necessary assimutes, and including all stars brighter than the ninch magnitude; that is, all those more than one third as bright as the planet, whose stellar magnitude at opposition is 7.7. Observars with an astronomical, or invertically

ce should remember to turn the diagram unside down before using it. To aid in the identification of the region, the de-tailed star-map, which includes the sonstellation Gemini, has been reprinted this stellation Germin, has been reprinted the bright month. On this, due south of the bright star Pollux, and just below the line of the ecliptic, will be noted the star 19 Geminorum. This, and the somewhat brighter star to the eastward, equally far south of the ecliptic, are the two b south of the carriers, as less than an a little below the path of Neptune. With their aid the planet may easily be found.

good field-glass should show to et, though as a pretty faint spe similar in brightness to the stars marked as of the eighth magnitude on the chart. With a telescope of two or three inches aperture, the peculiar greenish color of aperture, the peculiar greenish color of the planet may be recognized. At least four inches of aperture, and a trained eye,

too, will be needed to recognize any sensible disk.

The Heavens.
The winter constellations are so familiar as to us mo prolonged description. Taurus, Orion and Canis Major are respiendent in the southeast, and Gental and Canis Minor in the east. Lee is rising, and so is the head of Hydra. Ursa Major is low in the north-east, and Drace in the north. Cassioneia and Cepheus are well up in the northwest, and Cygnus is setting below them. Pegusus, Aries and Pisces are in the Delow tarm. Paparos, Ariev and Piscere are in the west, Cetus and Eridanus in the southwest, and Per-seua, and Auriga are right overhead. Before leaving this subject, we may call the attention of those who observe Neptune to a number of fine double stars in

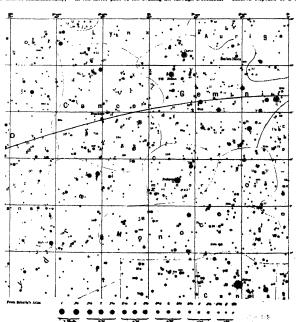
the same region of the sky : s Geminorum (Castor) splendid pair of about 5 seconds separation. « Geminor-um has a companion of 8.5 seconds at a distance of 6.6 seconds, and & Geminorum one of 8 seconds at a dis-tance of 7 seconds. Both of these are fine objects for a 8-inch telescope. ¿ Can-cri is a well-known triple. The closer pair, separated by only 1 second, can be resolved only by instruments of 5-inch aperture or more; but the companion 5.5 seconds from this system is separable by small instru

The Planets.
Mercury is evening at the beginning of mouth, but is too near the Sun to be easily seen. the 8th he passes through conjunction with the Sun and becomes a morning star. Toward the end of December he is fairly easy to rising an hour and a earlier than the Sun.

Venus is evening star and time as she comes for north. By the end of year she is almost of grees from the Sun, and a little after 8 P. M. Mars is just past conjunc-tion with the Sun, and is

hardly observable, as he rises only an hour before sunrise.

Jupiter is in conjunction with the Sun on the 18th and is invisible this month



THE HEAVENS IN THE REGION OF CANCER AND GENERAL

#### A Truck Guide Post

.....

(B) Secondary (Mant, Shagland) there has been been seen to see second a port for the profit on all the secondary unique. gives divertions to seen distant points a John of Ordents and Land's End, shile one theory indicates the way to Erris. On the top of the poet is a model are a hopane, while on the three principal igness are first register, and the ministers of a decking motor car, a motor speis, and a incomplane.

#### Wreck of the Submarine "F-1"

in it the Schriften Alexandar of October in the Schriften and the second for submarines established by the Scott Fellow in San Francisco Bay on September 6th. The host went to a depth of Sis feet. One of the readers of the Schriften and the Schriften in Schriften i

#### Giant Forest Hogs of Africa

A BOUT the time of the discovery of the Ackept, the natives of the Equatorial and Central African forests reported the existence of a large, pig-like animal which they had seen and gave thrilling accounts. BOUT the time of the discovery of the of the size and ferocity of this unknown beast. Owing to the habit of this crea-ture of roaming only in the almost imnetrable forests and jungles, few white on and explorers have been able to penetrate far into their haunts and kill one. The first specimens to reach America have just been received from Africa and mounted at the Museum of Natural His-tory, New York. The accompanying photograph shows the realistic appearance of these remarkable new comers. They are distinct from the wart hog. River hog and bush pig, and consider-ably larger, standing three feet high and six feet long. Natives report that they attain the size and height of a sebra and a rhinoceros. They are found only in the dense and remote equatorial forests of British East Africa. They are strictly a forest-living animal and sedom come out into the open. To capture or shoot one is very dangerous or difficult. Owing to the thick forest they must be hunted at close range, and they are apt to charge their enemy. The most conspicuous feat-ure of these beasts is their grotesque and formidable head, equipped with huge curved tusks. Below the eyes of the monster is a pair of warty growths, like the fungi which commonly grow on trunks of decaying trees. Their bodies are covwith long, jet black bristl giant hogs are supplied with dangerous teeth and tusks, and they prey upon vari-ous animal inhabitants of the forests. They are said savagely to attack native women who are compelled to frequent the wessen who are compelled to frequent the interior forests to gather fargots for fire wood. Some of the pigmy tribes of the interior, according to resports of the natives, capture these animals in pitfalls, after which they kill the besste by shooting them with pelessed arrows. The scientific name of the skan hops—"Helocheves senterprises"—in fully as dreadful as, the animals themselves.

#### Motorists' Bridges for Their Exclusive Use

BIDGES built like our tracks have been installed by the motorists of cross stress.

California to cross stress.

Readers are motied to contribute photographs of novel and curious objects, unique occurrences and ingenious contrivances. Such as are found available will be paid for promptly.



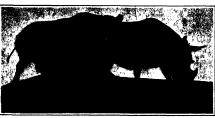


A curious guide post.

Nickel in the slot bench.



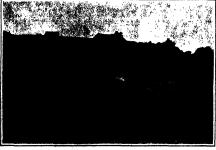
Wreck of the submarine "F-1" in Monterey Bay.



African forest hogs just acquired by the American Museum of Natural History.



Home-made gasoline ditcher.



Bridge built for the exclusive use of automobiles.

to ford the streams the heavy muchlines would sink in the sand, and, therefore, the Automobile Club raised the money to install this unique type of bridge. As there is no routway between the channels in which the wheels run, no horse-drawn vehicle can make use of the bridges; and this is just, in as much as the motorists paid the entire cost. Although the construction is light and thexpensive, yet it solves the problem very nicely.

#### A Nickel-in-the-slot Bench

DROP a nicket in the slot and get a bleft of the new park beach in use in San José, California. The plan of the inventor is to place his beach in public resorts, parks, etc. not to do away with the free benches, but in addition to them. This will take care of the unusual Sunday and holiday crowds, who cannot find accommodation, and it will also appeal to people who with an exchate seat and do not care to rule cllows with atrangers. Many people would gladit pay a nickel for this privilege, and the inventor expects to make enough on each bench to add to the revenues of the Park Commission, and my him a modest profit beddees.

As the hybridgraph shows, the bench is so adjusted that it cannot be used until a culn is dropped in the low at the side. This releases a lock and the heard; can be awang buck, making a reclining or racking out if desired. It is also equipped with an awang, not shown in this picture When vacated, the bench resumes its, former position automatically, and locks, ready for the next natron.

#### A Home-made Gasoline Ditcher

THE accompanying illustration shows In novel home-made gasoline ditcher constructed at Fulda by a Minnesota farmer The machine may be seen at work cutting a ditch one foot wide and say feet deep. The machine will dig to a depth of about 12 feet. Only one man be required to operate it A 15 horse-power engine is used, supplying power to dig 8 to 12 rods per hour, depending upon the depth of ditch and soil. The grade of the ditch is obtained by a line stretched light, and the gage rod from the main beam as kept on top of the cord.

#### Wild Honey in South Africa

M.R. E. N. MARAIN has published in M.R. E. N. MARAIN has published in a south African saricultural journal a number of curious facts concerning the wild honey of the northern Transvani. Two distinct kinds of honey are recognized, viz. the ordinary golden-yellow honey, comment with harts of the worther honey. The state of the worther hard with the published hard with the published hard with the published hard of the worther hard with the published as beautiful in appearance and of most delicious theory. It is also required to possess valuable therapeutic qualities. When expressed from the combined in the state of the state of the state of the condition of the published with the published with the published with the less extract it only from certain grasses. The histors are usually in hollow trees, sometimes in ant-bear holes or anti-bits.

Gathering wild honey appears to be a favorite pursuit of the Transvaal native, and one that has some peculiar features. The beschunders wear no protective clothing, but appear to be so thoroughly inoculated with formic acid as to be immune to its effects.

The favorite hones is produced by a stringtes bee, called the modal, of which there are two species. The larger of those builds only in the ground and in very hard soil. The little is found at the bottom of a shaft having the diameter of a lead pencil, and from two to five feet deep. The hone is not stored in the comb, but in was burs, each about as large as a good-stard fithinhic; those are comented together with way, forming a cluster about the size of an orange. A hive may contain from a few spoonfuls to two gallons of honey.

## Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### Some Old Key Rings

MANY interesting things are found among expired patents, espe when we touch upon an article in universal use. Nearly every one carries a bunct of keys on a ring of some form. Possibly the form most generally used is the ordinary split ring in which several convolutions are ispped side by side. In the patented art we find many forms, some of which we show in the accompanying engravings. A is a key ring, probably devised by a musician, since it takes the general form of the clef, and in this ring the crossed wires and the middle ball bear upon the adjacent wires with sufficient force to hold a key when inserted as

In B is shown a key ring of a novel form with a swinging latch which may be sprung over the end of the opened member to hold the ring closed.

C presents a form employing a linked chain and a fastening block for locking the chain closed.

D shows a form in which a flexible cable of braided wire is held at one end to a yoke, and is detachable at its other end so that it may be coupled up and uncoupled as desired.

presents a triangular form with a sliding sleeve on one end, which may cross the gap or opening for the insertion and removal of the keys, and this sleeve tongue operating in a key way in the wire

The ring F has a swinging bridge which can close the gap between the ends of

The ring G is made of two semi-circu iar sections hinged together at one end and springing into interlocked engagement at their other ends

The ring H is of a special form, and has its separable ends formed one with a recess and the other with a tongue to spring into and out of the recess in connecting and disconnecting the ends of the ring

The ring shown at I will be recalled by many. When the revolving U-shaped part is in one position, the key may be inserted in the opening of such part and then turned to the position in which said open-ing faces the interior of the ring. Thus the keys can be easily placed in and removed from the ring

J is a key holder without being a key ring, as in this construction a holding de ring, as in time construction a nothing de-vice is passed through the eyes of the keys so that they can turn independently upon the holder to bring any selected key into position for use

The ring K shows an interesting construction adapted for use as a key ring, and in which an open link has one of its ends threaded and a sleeve is threaded on such end so that it can be adjusted across the gap between the spaced apart ends to close the ring

All of the foregoing key rings are shown in expired patents. Some of the forms have been popular in some sections of the country; doubtless all have been used to greater or less extent and they to illustrate the exercise of considerable ingenuity in the production of simple de

#### An Electric Safety Lamp for Minera

#### By Robert G. Skerrett

THE British government set an example some while ago when it offered a prize of \$3,000 for an acceptable electric safety lamp for miners. A German engineer of the name of F. Faerber of Dortmund was the successful competitor to Europe, the annual loss of life due to mane explosions averages about one in even thousand operatives, while the



Some old key rings that have been the product of expired patents

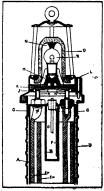
The electric lamp is outwardly very similar to the benzine safety lamp, which is extensively employed in mines abroad, but there the similarity ceases. The benzine lamp is not absolutely proof against the menace of fire damp, while the "Cage" lamp is. The electric lamp is of 1.5

yearly toll here is from four to five times | candle-power-having twice the illumin ating value of its benzine rival-and is cheaper to maintain, costing but 1.25 cents per shift The capacity of the storage battery is extremely high, and for a lamp of 1.5 candle-power there is electri energy enough for an endurance of sixteen hours, or two shifts.

The Cage lamp consists primarily of



A miner's electrical safety lamp that won a prize of \$3,000.



Longitudinal sections

ction holding the incind light and a lower one in which is he the storage battery. The accumulator of circular cross-section sealed inside a celluloid casing. The form adopted the battery elements is one calculated to withstand the rough treatment unavoid-ably incident to mining. Heretofore this elements have been in plates which half to be handled far too carefully to make their employment in a lamp of this sort practicable. By making use of cylindrical ements. Faerber not only obtains the desired rigidity, but he obviates the warping common to ordinary plates when they are overcharged or when too much discharged. Because of this characteristic, it is possible to charge the present battery to an exceptionally high capacity. This explains the endurance which is ob-

In order to remove an exhausted cell, it is necessary only to cut through with a knife a band of celluloid paper which forms a seal. A new accumulator can be put in place in a very few moments without damaging the outer casing of celluloid which constitutes the housing for the cell. A new strip of this paper completes the installation again. Of course, it is very necessary that the lamp should not open inopportunely. To prevent this, a lock working upon the bayonet principle is provided, which is quite effective, having been previously thoroughly tested out in the old benzine safety lamps in service. To turn the current on or off, it is nece sary only to rotate the top of the lamp through a small angle. By this means a contact is made and broken with conntions rising from the bus-bars of the positive and negative elements.

The gases formed within the lamp are permitted to escape from the cell by fol-lowing down a small tube F, which is contained within the cylinder B, and thence passing outward to the atmosphere by way of tube C. The arrangement is in-genious, and, as will be seen, effectually provents the escape of the electrolyte should the lamp be upset or laid upon its

To guard the incandescent light from shock, it is virtually suspended or held in place between two opposing spiral springs This installation is then inclosed within a thick glass cover. Metal stanchions and a rigid top further shield the glass from the accidents of ordinary service.

The general outward form of the lamp is free from any troublesome projections that might catch in the miner's dress or be easily knocked off by contact with surrounding objects. The exterior casing is of heavy corrugated tin drawn from a ingle piece, and, therefore, quite capa of standing pretty rough usage. The inentor has been continually mindful of the rather heedless character of the r and of the rugged nature of the work expected of him, and the Cage lamp reflects this consideration in every department of its get-up. These lamps already extensively employed in mines, both in the British Isles and in Germany, and it is said that they have given the utmost satisfaction in every particular.

#### Automatic Car Coupler

THERE has long been a demand for a car coupler that is absolutely automatic. To be sure, there are automatic couplers now in use, but it frequently happens that the couplers have to be alined musly to bring them in proper regis tration for automatic coupling. Difficu tion of these couplers when one of the knuckles is in open position. Becently an inventor who halls from Strasburg, Vir-gitals, has devised a car coupler in which the members are brought into suitual cothen both innesites are closed at the time ther approach each other. The design of this compler is similar to the my type, but it has in addition a greened plunger which renders the coupling automatic, and serves to retain the parts in locked condition when the cars are rounding a curve. The knuckles are also of booked form and rounded in wardly, so as to guide the corresponding knuckle of the other member into engage ment therewith. In a test of this coupler, it was found that it would operate when the cars were very gently shoved together. and that it would act either on a curv or on a straight line. It was also proved that it would pick up a runaway car, it only being necessary for the locomotive to follow at a greater speed than the run away. The new coupler will operate satis factorily with any of the standard types.

#### Notes for Inventors

Osene as a Water Purifier.—In many European cities ozone works have been erected for sterilizing the drinking water and it is reported that satisfactory results being obtained. Typhoid, cholers and sentery bacteris are claimed to be dedysen stroyed by the ozonization process, and as stroyed by the ozonization process, and as the process may be used on a small scale, portable apparatus adapted for domestic use may offer a field for useful invention.

Cooling an Engine Independently of the Engine Speed.—In patent, No. 1 043,344, Yongen Newman of Monroe, Utah, presents in connection with an internal combustion engine, a thermostatic device exposed to the heat of the engine, a fan driven by the engine to cool it and means to regulate the speed of the fan independently of the engine speed and including a connection bethe regulating means and the thermostatic device, so that the speed of the fan will be varied independently of the d of the engine and in correspondence with the temperature of the engine.

Life Preserver Within Bathing Suit John F. Burke of Philadelphia has obtained a patent, No. 1,041,012, in which is shown a bathing suit with a body garment within the bathing suit, comprising buoyant body portions and leg por-tions that are flexibly connected so that they will be held in place without the connections interfering with the movements of the we

Waiking Head Down.—A theatrical ap-paratus has been patented to John W. Frakes of Chicago, Ill., No. 1,040,303, in which a series of vacuum cups open at their bottoms are arranged in a row and con-trollable means are provided for exhausting air from the said cups and for admitting air to them, and the performer has plates secured to her feet and adapted to operate as closures for the cups, so that by properly nipulating the controlling devices the former can walk head down along the row of cups.

An Improved Educational Device patent has been granted for an educational device which includes a ring-like passage-way and cross passageways within the ring and communicating at their ends with it, so that double faced buttons carrying letters or other characters may be shifted along the ring and thence into proper relation with the cross passages to spell words or for other purposes. The patent, No. 1,041,059, is issued to John H. Fox of Beres, Ohio.

A Westinghouse Company Electrical
Distribution Patent.—Paul M. Lincoln, of
Pittsburgh, assignor to Westinghouse Electric and Manufacturing Company, has pard, No. 1,089,767, a system of elecdistribution in which there is provided a number of line sections with means for supplying energy of different character to the respective sections. Normally de-energized intervening sections are arranged with respect to the energised sections and means are supplied for connecting the intervening sections to one or the other of the adjacent energized sections so that the rebicle may pass from the intervening de-

RECENTLY PATENTED INVENTIONS These columns are open to all patent The notices are inserted by special arra-ment with the inventors. Terms on app flots to the Advertising Department of SCIENTIFIC AMERICAN.

#### Of Interest to Farmers.

Of Intercent to Farmers.

CRICKEN PERD TROUGH—O, H. Lar,
1118 Hartey St., Omaba, Neb. The invention
provides a trough for fowl and prevents them
from scratching or wasting the feed; provides
a trough roard which may be quickly adjusted
therein after fred has been deposited to in this
manner avoid interference with the loading of
the trough; provides a trough and guard which
provides a trough and guard which
provides a trough and guard which
and the same.

#### Of General Interest

Of General Interest.

PROCESS OF TREATING THE CANDELILLA-PLANT FOR THE RECOVERY OF
WAX.—W. S. WARROW, Lock Box 1, Butter,
Pl. An object here is to provide a process
for treating the candelilla-plant in order to
recover the wax and to leave the plant in
such condition that it may be subsequently
used for food. The invention provides a
used condition that it may be subsequently
used for food. The invention provides a
used condition that it is not be subsequently
used for food. The invention of the plant by dry steam,
with a final treatment by water.

VIOLING-G. J. JUNESS. SECT WITE Brow.

WIGA is an any treatment by water.

\*\*TOLIN.S.G., J. UNNESS, care of Wirz Bros.,

Gressville, Ill. This invention refers to

stringed instruments of the viol type, such as

violins, 'cellos, bans viols, atc. The object

is to provide a violin arranged to produce a

rich and deep tone, to permit fangering of the

strings, and to maintain the strings in tun
for a long period without retuning.

for a long period without retuning.

PART FOR WIGS AND THE LIKE.—M. R.

ROMENKOWSKY, CAPE OF M. R. HEFTE, Menhattan, 801 Southern Boulevant, New York, N. Y.

In this patent the invention has reference to
improvements in parts for wigs and the like.

In this patent the invention has reference to
improvements in parts for with a service of the supporting exams or lacting at any point, but
will only show a groove or part in the hair
FOLDING (AMERA CARE.—B. P. PERES
SON, 1225 FITCH AVE. Minnespolis, Minn. The
invention in this instance relates generally to
particularly it involves a construction wherein
It is not necessary to remove the camers from

It is not necessary to remove the camera from the case when it is desired to use the camera.

the case when it is desired to use the camera. HOT WATHEN YEBBEL—S. W. LORING, 1878 There's Ass. K. LERNES, W. LORING, 1878 There's Ass. K. LERNES CHT, MO. This reveal to arranged with non-detaible flat, convex and concave surfaces, adapted to fit various parts of the human body and capable of giving of a graduated amount of heat, the vessel being arranged for use as an irrigating toxon, by suspending the vessel and using the same as a task connected with an irrigating tube to discharge the bounder pressure onto a desired part of the body.

#### Hardware and Tools

COMBINATION TOOL.—J. BrAUDER, 426
Locust St., Mount Vernon, N. Y. This tool,
a sectional side elevation of which is shown
in the engraving, is provided with interchangeable tool members to permit of readily converting the tool into or using it as a hammer,



commentation tool.

clear hammer, ads. hatchet and the like. Use the state of the s

handle takes place without aid of any furti names takes place without sid of any further means of attachment such as comment or lives, and is effected by making the part of the handle left between the perforations for the double tang greater than the space between the double tang at the function with the blade, so that the tangs when forced into the handle holes are forced apart and the ter-ninal hooks on them are driven into the ma-terial of the handle.

#### Machines and Machanical Device

Machines and Nachanical Devices.

RESTATOR GATE CLOSHIG, DEVICE—2
L. MURRAY, 202 N 8th 8t., Council Blufs.

lows. This inventor provides a device for automatically closing the gates of an elevator shaft, whenever the elevator car leaves the floor in either direction, and set in operation by the elevator's movement, and so arranged that the car can not leave the floor without operating the mores for closing the gate.

operating the means for closing the gate.

PIPR CUTTING MACHINE—I. R BLACKMORE, 9 Small Ave, Caldwell, N J The object
here is to provide a novel contraction for drivling the base or supporting rollers as well as
for driving the cam for directly operating the
ling the operation of the cutter to suit the
diameter of the pips.

MEANS FOR OUTERATING GATES,—C. W
MYSTIL and F. O. WILLIAMS, Assiomits, Fa.
This road gate may be operated by the occupant of a vehicle upon approaching the gate,
to cause the gate to nave in a direction away
volicle has peased through the occupant can
close the gate behind him. An object of this



MEANS FOR OPERATING GATES

invention is to provide a gate-operating means as indicated, and in the form of attachment that may be applied to ordinary gates with-out any great modification in the latter. The accompanying illustration shows a perspective view of a gate equipped with the improved negating devices

operating devices

NOREMIESS \_ ARE FOR NOISY MACHINES \_ F O'Brans, Jarbidge, Nov The
casential novelty of this laveston is that it
removes the noisy medium, str. Current
it removes the noisy medium, str. Current
it removes the noisy medium, str. Current
it removes the noisy medium, str. Current
it removes the noisy medium, str. Current
it provides the current
means for operating the inclosed machine from
without, and by a key operated valve connect
the case, when closed, to a vacuum chamber
which removes the strength medium to the current
medium removes the connection of the current
medium removes the curr

which renowes the air.

VARIABLE, SPEED MRCHANISM—R M
RUCK. 44 Thurlos Equare, South Kenshutton,
London, England For the purpose of the
invention the wheels of progressively varying
form, in effect, toofued come whose inclinations are opposed to one another, while the
relative positions of the whoels of the two site
are such that only a single pair of changetime and that progressively varying speedratios may be obtained by shifting the slifable
set of wheels through progressively varying
distances lengthwise of its shart was as to
operation control of the shart was as to
operation controls.

#### Railways and Their Accessories

Railways and Their Accessories.

It is the RERENCY BLAKE SETTING DEVILED.

It is the RERENCY BLAKE SETTING DEVILED.

It is contained by the set of the set

ing many worded or lengthy train orders, at the same time insuring a high degree of safety in running all trains

in ransing all trains
METAL DOOR.—L. G. Fowler and H. V.
TROMAR, Billströurn, Mo. The invention is an
improvement in metal doors, especially adapted
for railirod cars, wherein the door is provided
with reinforcing ribs formed by bending the
material of the door upon itself, together with
the particular form of truss rod.

MEANS TON VANNEY.

the particular form of truss rod.

MEANS FOR VENTILATING RAILWAY
AND OTHER CARRIAGES—F GAIN, 40 Rue

of l'Arcade, Paria, France This device for
use in vestilating carriages consists of a series
of vertical glass artips mounted on pirots in
a frame which is mounted in the wall of the
carriage, these strips being connected by a
coupling rod which enables them to be displaced all together

placed all together LUBRICATING DEVICE—R. PLYMARE, 720 Corbett St., Portland, Dr. The principal object here is to provide a device adapted to inbricate the cur wheel flangers, the device being moved into operative position by simple means within away reach and control of a person in charge of the car as conductor or motorman.

Pertaining to Vehicles.
PNEUMATIC TIRE FOR WHILL A
WHIRELS—E R. RIGINSHE, 84 Upper KenIndigon Lane London, N Library
Daniello, The
Daniello, The
Daniello, The
Daniello, The
One of which carries a solid rubber tread hand,
while the inner rim is permanently attached
to the felly of the wheel. Between the inner
protected by a pair for desirt cheek of rubber
and canvas fabric lietween the intermediate
rim and the outer rim are annuint risingingplates secured by transverse boits which eart

\*\*PNEUMATIC CHRITION PRO VENDILLA RES

a wedging action between the rims PNRUMATIC CUSHION FOR VEHICLES —J O DAVIS, R. P. D. NO. 4. PAWNER, OBLA, The object here is to eliminate as far as pos-sible, joiling and jarring as the vehicle passes over ground obstructions, without employing expressive pneumatic three used on automobiles and other motor of them vehicles. The inventor utilizes a cushion preferably tubular in form,



PNEUMATIC CUSHIONS FOR VEHICLE

to take up vibration of a vehicle in motion; and he locates this cushion between the axis and the exprises which support the chassis of the ear. The springs need no carriage springs need no not a number of strips or leaves which motivate the number of strips or leaves which as the number of strips or leaves which as the number of strips or leaves which as show which rests upon a part of the tubular cushion. The caparating shows a transverse wortion of the cushions as positioned on the reser axis. to take up vibration of a vehicle in motion :

Berlino of the Canadas as possesses we will be a second of the Canadas and C. T. Northwarz, 111 Northwarz Baco, N. Ormans, N. J. This Invariant Place, N. Ormans, N. J. This Invariant refers to a form of resilient tires for automotive and other vehicles, and particularly relates to that type of resilient tires which are not intended to be lateral and the control of the control of

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each Please state the name of the patentee, title of the invention, and date of this paper.

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## The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospec The Editor will endeav to answer any questions relating to machanical features, operation mercial motor pchicles.

#### Waste in Truck Tires By J. M. Gilbert

FROM a constructive standpoint it is A a fine industrial accomplishment to to build a solid rubber tire that it is in every way equipped to render a miseage service wholly commensurate with the dollars and cents investment of the user. On the other hand, it is quite another matter to have the structural strength and natural service-yielding qualities of the tire so conserved, through proper usage, that it will produce its full quota of mileage before being forced into premature deterioration through abuse and perfect

In promoting an economic tire service the scope of the tire manufacturer ha pronounced limitations. When once his product passes into the hands of the consumer, systematic co-operation is neces sary to secure the result sought after— the greatest possible mileage at the low

As a matter of fact, there is a tremendous waste in truck tires. Some of this waste is due to ignorance on the part of truck operators. However, much more of it can be traced to lax methods, short-sightedness and downright abuse. Many drivers apparently entertain the misplaced idea that solid tires require no looking after so long as they remain on the wheels and run They seem to reason, further that inasmuch as they are protected by manufacturer's guarantee, the treat ment they give their tires has little or no direct determining value upon their tire maintenance cost This is an absolutely fullacious concinsion

#### Mileage and Cost.

A manufacturer's guarantee of mileage, whether it be for 6,000, 8,000 or 10,000 miles, has little or no effect, ultimately, in fixing tire costs beyond establishing a ment of time for any truck operator. maximum cost. That is to say, if a manu facturer guarantees his tires for 8,000 miles and by careful driving and the proper handling of them the owner gets 10,000 or 12,000 miles of service, he has reduced the operating expenses of his truck to the extent of the extra mileage true to the extra black of the such cases the operator, blusself, has been directly responsible for faing a minimum of the cost, frespective of anything the manufacturer may have promised him in ad-

Furthermore, the manufacturer doe not say to the user that his tires are guaranteed for a certain mileage regardless of the uses and abuses to which they are put. So here is another very logical rea-son why it is profitable to give tires the attention they deserve, not only because of their inestimable importance in truck equipment, but because they are expen-

#### Overloaded Tires.

Truck operators who do not safeguard their tires against the common forms of abuse which shorten tire life, are bound to find their bills for up-keep far in excess of what they should be. There are a few profitable "don'ts" which should be posted conspicuously in every garage. se of them follow:

Don't overload your tires. Bear in mind that they must sustain every ounce of weight above them. When overloaded ater burden is imposed than the manufacturer designed them to carry. The result is they break down prema therefore, entirely justifiable to allow there has the break and do not yield any, from twenty to twenty-five per cent on the where near the milesage they are capable jurchase price of a horse each year under

#### Carrying Capacity.

Single. Pounds.	Dual. Pounds
650	1,400
950	2,500
1,875	8,500
1,750	5,000
2,000	6,000
8,000	8,000
4,000	10,000
	Poulds. 

#### Determining the Load.

It is an easy matter to determine whether a truck is sufficiently tired to carry its load. Run it on the scales and get the total weight. Then back off the rear wheels, leaving the front wheels as near the center of the scales as possible Record this weight and deduct it from This gives you the load rear wheels are carrying. Supposing the combined weight of the truck and load is 13,000 pounds, distributed 3,000 pounds front and 10,000 pounds rear, this truck requires four-inch single tires in front and tour-inch dual tirou in the rear. If the truck is not equipped up to this stand you may be sure it is under-tired and that an overload is being carried.

#### Care of the Tire.

Excessive speed is incalculably hard or tires. When a truck is bumped recklessly along at an immoderate pace the strain on the tires is terrific and they soon go

Care should be exercised in stopping and starting. Sudden and violent action has a tendency to separate the tread of

a tire from its base.

A truck should not be left standing over night under load. To do so imposes an unnecessary strain on the tires.

Oil is a natural enemy of rubber and tires should never be allowed to rest on a greasy garage floor

A little sound reflection on the tire one Give it a trial and see if this staten

isn't true

#### The Motor Truck's Span of Life By John R. Eustis

I N computing the cost of operating and maintaining motor trucks, it is customars to include depreciation as one of the This item varies from ten p or twelve per cent to as high as thirty three per cent of the purchase price of the vehicle, the higher percentage prevail ing a few years ago and the lower per-centage being the rule now-s-days. In other words the life of the motor truck is estimated at from three to ten years.

#### Depreciation Charges.

The practice of including depre among the items of expense is undoubtedly a continuance of a similar practice in connection with horses, for it must be understood that most of the motor trucks sed are doing work formerly done by horses and in the service of the same own ers Many years of experience with workhorses taught the obvious lesson that a horse costs so much in the beginning, so much each year for feed, shoeing, veterinary service, etc. and at the end of a ce tain period of time, dies, then becoming n total loss, except for the few dollars its hide will bring. The United States Dehide will bring. The United States Department of Agriculture has compiled and published statistics which prove that the average working life of a horse in this country is five years, and in the larger cities a little more than four years. It is, purchase price of a horse each year unde the head of depreciation.

In continuing this practice when motor The following table shows the average trucks are substituted for horses, an in-

cost of operating and maintaining motor trucks, for the latter have been able to above anistactory council, even where the deprectation charge was high, but in that it sets the limit of a motor truck's life at a few years.

#### Horses Cannot be Renaired

Under the customary methods of com outing the cost of operating and maintain ing motor trucks, all repairs and replace-ments are also charged. Under these two heads, the expense of keeping motor trucks in good running condition is pro vided for, and if all necessary replace-ments have been made, then at the end of a number of years of service the own has a vehicle capable of doing the san work that it did when new; yet it migh be that at the end of teu, twenty or thirty years, not one part which was in the original vehicle remains. This, then, is the real difference between horses and motor truck as far as their span of life is con cerned, and it would seem not altogeth incorrect to say that the motor track's span of life is everlasting.

The proof of the pudding is of course in the eating, and the life of a motor truck can best be estimated from actual experience. Unfortunately, however, the commercial motor vehicle is of such re experience. cent origin that a number of years mus elapse before the theory in this case ca be substantiated by actual practice. There are, however, a number of motor trucks of various types which have been in cor stant service in this country for from five to ten years, and most of them can do as much work to day as when new Furthermore, the present day vehicles are vastly superior to those manufactured be tween 1902 and 1907.

#### A Department Store Experience

A large department store in London is A large department store in London is operating twenty-two motor vehicles, which have traveled a total of 1,110,000 miles, or an average of 50,000 miles for each vehicle. One of these vehicles has averaged close to 12,000 miles per year for eight years, and its owners state that it is giving just as good service to-day as it did at the beginning. If there is a limit to the life of a motor truck, it has not as yet been dete

Motor Truck Queries and Answer A. W. R. writes: I have noted state ments to the effect that the block tire to motor trucks, because each block is sur

rounded by air, keeps much cooler in service than the continuous solid tire. I will appreciate any information on this atter that you can give me.

While we have no exact di block tire, we know that under exceedingly heavy loads they give a better performance than the continuous tires; for formance than the continuous tree; for instance, in coal trucks and the like. Theoretically the block tire dies met goal erate the heat that the continuous tire does because it has more radiating supface, and because the rubber has an sp portunity to displace more easily. thermore, in blocks there is no ac Für lated wave, such as there necessarily is in an endless tire, the lack of which wave cuts out strain at the base of the tire, and also increases the mileage, as the wonless part of the solid tire is the laint betw the base and the tread rubber.

M. R. S. writes: Is the steam most truck a possible factor in this downtr, and is it not the logical type for ver

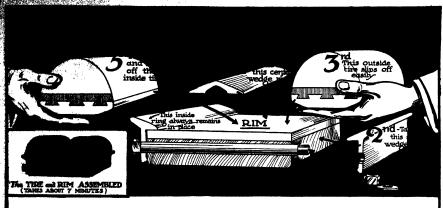
heavy work?
A. Outside of the British Is steam truck is hardly known to-day, and steam truck is hardly known to-day, these it is giving way to the gar-vehicle. As for heavy work both the si-tractor and the steam need solic-rapidly being supplied by these his gusoline angines, so there their but in much planning than the contraction.



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# 39 G. V. Electric Trucks For the Philippines

The U. S. War Department, Manilla, uses 19 G. V. Electrics for hauling distilled water, ice and stores. Should you send your soldier nephew a Christmas present "ten to one" a G. V. Truck will deliver it.

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Here is a 1-ton G. V. Truck which has been in service over six years. It received no special care—in fact, the body was not painted for the first five years. At the end of five and one half years the wagon was thoroughly



overhauled and because this unusual course had become imperative, the charges against the truck were computed for the first time. They came to \$1509.00 for the five and one half years.

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itself had more of a quasi-mismille inntil the nineteenth century was any in dustry again based upon it or the a oution of it revived. At the present time however, it is considered to be the best street paving material available.

street paving material available.
The ancients gathered their asphalt from the Red See, which to this day produces a minor quantity, but the largost portion of the world's supply comes from Trinidad, Venesuela and Cuba. Trinidad asphalt, although at first used as a subaspirat, atthough at larst used as sub-stitute for coal tar, and an improvement on it in roofing and like purposes, is the substance now generally used in the United States for street paying, and of the fity millions or more of square yards laid in the country, it is estimated that at least seventy-five per cont of this is mixture in which Trinidad asphalt forms a part. The deposits of the pitch lake in Trinidad occupies a bowlike depression of about a hundred and fifteen acres which is probably the center of an extinct The center of the lake is no quite a mile from the Gulf of Paris and is about one hundred and thirty-five feet above the level of the sea, and its contents are of remarkable uniformity, and its surface is in constant motion, there appearing at times what may be termed currents and eddies. The middle of this wonderful lake is about one foot higher than the edges, this relation being main-tained, although the body as a whole has been lowered by the constant removal of material. There is an overflow from the lake to the sea through a crevice in the rim, and this stream is from 15 to 18 feet deep, but beneath this stream is a ravine still filled with asphalt, which seems to have no limit to it. The asphalt that comes from Trinidad is too brittle for fore, be mixed with other material befor fore, he mixed with other material belove it is finally used for paving. The depth of the lake at Trinidad is supposed to be about one hundred feet, although the actual bottom of the crater-like depres has never been reached. The pitch itself can be picked up and molded without soiling the hand; but one of the most peculiar characteristics of this strange body is that the deposit renews itself almo soon as it is removed. The asphalt lake in Veneza

ated across the Gulf of Paria about 105 niles due west of the Trinidad lake. This body covers an area of about one thousand acres, being nearly nine times as large as that of the lake at Trinidad, how the late of Trinidad, however its deposits are only a few feet deep in some places. So not only is the supply from Venezuela not nearly so great as that of Trinidad, but it differs from it, as it is not always uniform and at time is softer, but notwithstanding this differ-ence in quality some scientists claim that the two lakes are geologically connected Cuban asphalt comes from various parts of the island, and in one location, the Bay of Cardenas, it is actually drawn up from the bed of the bay itself, through eight or nine feet of water. The surface of at asphalt lake, except for small wooded islands, is bare of vegetation and hard enough to bear foot traffic or even carte in the cool of the morning, while by th aid of a sort of corduroy road made of paim branches it supports a cable tram way. The work of mining asphalt is sus pended during midday as the stuff be-comes to hot to work with: in fact, an n earth.

Geographic distribution of asphalt or its allied bitumens is a well-classified phe omenon, although new sources have been discovered from time to time, the sear for coal and petroleum often revealing a hitherto unknown bed in an unsuspected part of the earth. In Egypt deposits of a very pure asphalt occur and have per-hape been known since the beginning of history, and from an immemorial period asphalt has been cust up by the Dead Sea which, at times, has been exploited con-mentally. In Asia Minor, Person, and the vallege of the Suphrapa, in the vallege of the

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#### The Heavens in December (Concluded from page 1/2.)

st opposition, and is a splendid object in the evening sky, appearing fully equal to Capella in brightness. His rings are now apparently opened at a wide angle. well repays telescopic study, even with a very small instrument.

Uranus is in Capricornus, too low in the west to be observed, even early in the evening

Neptune is in Gemini, as illustrated on

The Moon is in her last quarter at 4 A. M. on the 1st, new at 10 A. M. on the 8th, in her first quarter at 1 P. M. on the 16th, full at 10 P. M. on the 23d, and in her first quarter again at 1 P. M. on the 30th. She is nearest us on the 25th, and farthest away on the 14th. In her circuit of the sky she passes near Mars on the 7th, Mercury on the 8th, Jupiter on the 9th, Venus on the 11th, Uranus on the 12th, Saturn on the 21st, and Neptune on the 25th

At 11 A. M. on the 21st the Sun reach its greatest southern declination, and in almanac parlance, "winter commences;" while at 8 P. M. on the 31st the Earth while at C. R. on the Sist the Earth passes through that point in its orbit which is nearest the Sun. Princeton University Observatory.

#### Public Support of the Aeroplane Fleet in France

THE following data have been issued concerning the funds collected by public subscription for the French aeroplane fleet and also the credits voted by Parlia-ment for the same purpose. For the ment for the same purpose For the budget of 1912, Parliament voted the sum of \$1,500,000, to which is to be added the funds raised by subscription, or \$348,000. making a total of \$1,848,000. This sum has been employed as follows: Aeroplan orders pending from now until the end of the year, 90 seroplanes. This will give a total of 362 aeroplanes purchased with the above amounts during 1912.

As concerns the purchase of aeroplane by the French army, the authorities have made an interesting decision lately Starting from October 1st, a new commis sion will carry out this work, and its object is to decide upon the number of aeroplanes to be purchased according to avail-It is composed of Colonels Bouttieaux, Etienne and Breton, chiefs of aeronautic centers. It will hold meetings twice a year and make out the order lists for the next six months so as to bring about a regular production and not over crowd the factories. The formerly exist-ing seroplane commission will now be limited to examining the specifications and reception of seroplanes. In short, the first commission is occupied with the numher of machines and the second with their quality. By next year the army expects quanty. By next year the army expects to have three types of aeropianes in use, a very rapid machine for single pilot which can readily be displaced, then two-place machines for scouting trips of some length, besides armored aeropianes provided with guns.

A COORDING to the London and China A relegraph a project is on fact to build a mailway on the wall surrounding the city of Patter.



#### How this Self-Priming Device makes cold-weather starting easy

Gasoline motors need a heavy charge of gaso-line to start them in cold weather,

Generally this is ob-tained by flooding the carburetor. Or, when still more gasoline is needed, by injecting it directly into the cylin-ders through the relief cocks.

The air supply to the earhure-tor is controlled by a shuter operated by a handle conveni-ently piaced on the dash

The Hupmobile gasoline system— pictured above and explained in the text-shows many distinctive features of motoring convenience that

are well worth your notice.
Study especially the hot-air control and self-priming device

By these you are enabled to start your motor in cold weather almost as easily as you do in summer.

casily as you to in summer. his device, together with the direct fuel feed; the gasoline cleaning acreen; the emergency supply; go to make a system as complete as engineering skill can accomplish

can accomplish
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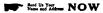
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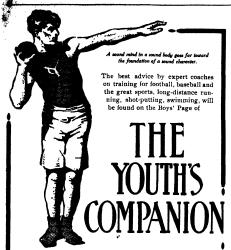
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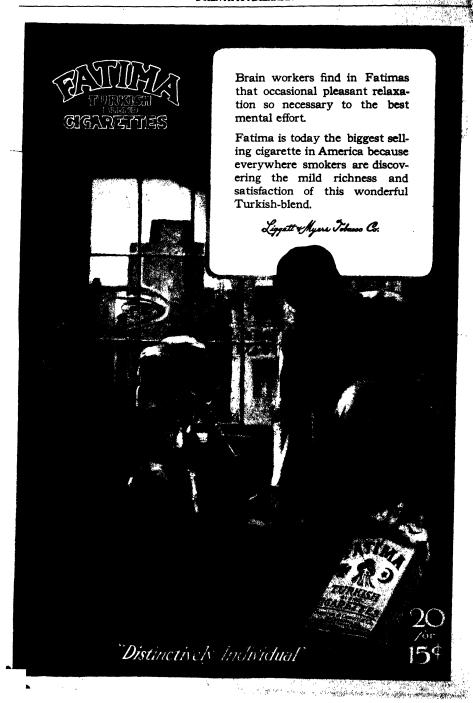
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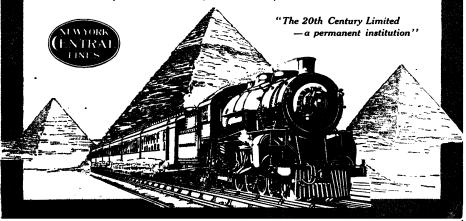
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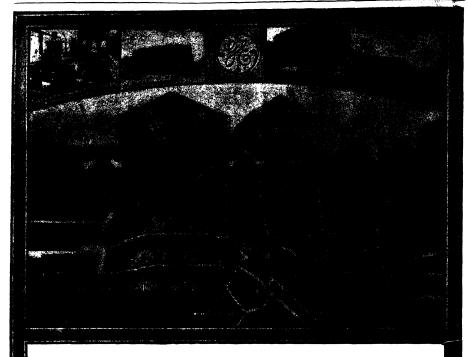
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The purpose of this journal is to record accurately. simply, and interestingly, the world's progress in solitife knowledge and industrial achievement.

#### Gratifying Conditions in the Navy

CAREFUL reading of the annual report of the Secretary of the Navy will satisfy every impartial mind that things are going well in this important department. This journal has watched the development of Mr Meyer's administration with a critical but always friendly eye; and although, at the outset of his control, we felt called upon to criticise certain of the changes which he introduced, we are frank to admit that the results achieved during the past four years, entitle his administration to be considered one of the most successful in the history of the department. Altogether pardonable is the evident pride with which, in this report, Mr. Meyer refers to the mobilization of the Atlantic Fleet, which took place in the North River, New York, during the autumn of the prese The gathering together in orderly review and at so short notice of a fleet of 123 ships aggregating 720,480 ions, tells the story of preparedness and efficleary. We trust that this review, because of its pow-orful educative and stimulating effect upon the people of the United States, will become an annual institution.

The Secretary opens his report with a plen for mak-ing permanent by legislation his system of naval aides. hig bernament by legislation his system of mayal aides, whose duties are to advise the Secretary on complex questions calling for technical knowledge. Three years' experience convinces Mr Meyer that the effi-cient subministration of the Nay cannot be accoun-pidised by a Secretary, unless he is assisted by a loared or connect under up of technical advisors. The aides greet in full council daily, and they meet the Secretary at least once a week. Congress should now give to this arrangement its legal sanction. It is recommended that in order that the Navy may get the highest pos-sible efficiency and preparedness for war, a council of National Defense be arranged, which will in a way be a vehicle between the Navy Department and Congress It is suggested that the council be made up of two cabi net officers, four senators, four congressmen, two arms officers and two navy officers.

The preparedness of the fleet as regards repairs and upkeep has been maintained at a most satisfactory standard, and the ships have been generally in a constandard, and the samps have now generally in a con-dition during the year to respond to the many calls that have been made upon them. This has been due to the development of a spirit of self-dependence, every ship being made self-austalning as far as possible; the establishing of routine docking and repairs; the standardizing of unior changes and alterations; the use of fleet auxiliaries; and improvements in yard methods In 1912 there were 166 ships in active service or ready for service, as against twenty on the repair list—an excellent showing.

The General Board of the Navy recommends an in crease of the Navy at the coming session of Congress by the addition of four battleships, two battle cruisers, sixteen destroyers, six submarines, a dry dock and a submarine testing dock, two transports, one ammuni-tion ship and one supply ship. It is pointed out that the four battleships will simply replace four existing buttleships which will be twenty years old in 1914 and must then be withdrawn. While battle-cruisers are ommended, the Board thinks that they should not recommended, the fourt timins that they should not be built at the axisons of the battleship programme, the particularly beed of the may being for more battle-ships. The Navy certainly needs the transports that are asked for; we are asteodished to learn that the "Paralle" and the 'buffalo," the only ressels at present available for such dity, are both over twenty years a suitable for such dity, are both over twenty years and cuttrely did and that "both are single-bottom ships, and cuttrely lacking in water-tight subdivision, having been originally designed as freighters." It is simply murderous, in view of what happened to the "Titania," to be using as mival transports, old ships that would be doomed if they experienced a serious collision.

As regards the engineering competitions, we are glad to learn that the performance of the vessels, almost without exception, has been highly creditable both as regards speed and economy. The larger vessels, we are told, either exceed or fall slightly below their contrast need, which in view of their increasing age indicates high state of efficiency and continued attention to detail. The new desiroyers, almost without exception, duplicate and frequently exceed the speed made at the time of their delivery to the Government. In the matter of smoke prevention, oil-burning destroyers have constantly improved, and the entire flect can now steam at high speed without any smoke whatever, a fact of which the writer has been witness whon present with the torpedo fleet.

powder is entirely satisfactory. The fact that the nitro-cellulose powder used in our Navy is broadly similar to that which destroyed the French battleship "Liberte" need cause no uneasiness. The French methand our regulations for stowage, inspection, etc., are comprehensive and very strictly observed. Since the adoption of the present type not one accident due to decomposition or spontaneous guitton has occurred. or service has such a record.

The present subdivision of work in the Navy Vards into a hull division and a machinery division, we are told, has been eminently satisfactory. This is proved This is proved by the efficiency and economy with which repairs are undertaken and completed. Mr. Meyer impre necessity for securing a spirited co-ordination in the administration of the Navy Yards. He approves of the recommendation made by the joint Army and Navy Board, that there should be two great naval bases on the Atlantic coast, in harbors which could receive and maintain the entire fleet and its auxiliaries. In keeping with the Department's policy of concentration, the naval stations at Pensacola, New Orleans, San Juan, Culebra and Sitka have been closed.

An urgent plea is made by Mr. Meyer for the creation of the admirals and vice-admirals which are necessary for a properly administered fleet. No provision is now made for any except the lowest grade in rank, namely, that of rear-admiral; whereas the recognized grades are admiral of the fleet admiral, vice-admiral and rear-admiral. A battle fleet should be commanded by an admiral, vice-admirals should command squadrons; rear-admirals should command divisions. We have more vessels in commission than most of the nations giving higher rank to their officers; yet when our fleet enters foreign waters, our naval officers are compelled to yield precedence to ranking officers of the smaller nations. It is not a question of our navai officers as individuals being placed in inferior positions when they meet the fleets of other natious, but rather it is that in the eyes of other nations we put ourselves in the position of an inferior.

#### Fixing the Price of Patented Articles

OR the sole purpose of encouraging the arts, the Constitution of these United States grants to a patentee the state of the constitution of the con to a patentee the right to dictate the conditions under which his invention may be manufactured, used and sold, a right which may be exercised only during the life of the patent. Extensive though his privile may be, we have still to hear of any flagrant instance in which the patentee has abused them Indeed, he could not if he would. The public, not being deprived of anything that it ever enjoyed before the patent was ranted, would refuse to buy paraset articles which may be obtained only by observing conditions too onerous and which it can well do without. Good me-chandbeing demands that the patented article be sold ut the lowest possible price in order that the widest pos slile public may be reached. In recent years there has been an increasing tendency on the part of manufacturers to take advantage of the constitutional right of fixing the price at which a patented article may be sold. The result has been exactly that contemplated by the framers of the Constitution—the encouragement of new industries and the general distribution among the public of new, useful and inexpensive inventions that have made commercial and domestic life more attractive than ever.

One of the provisions of the amended Oldfield Bill seeks to destroy this time-honored right of the patentee, despite testimony from the foremost manufacturers to the effect that the fixing of selling prices on outthe effect that the fixing of selling prices on patential products have redounded to the benefit both of the unnufacturer and the public. The representatives of companies whose patented ways are advertised the world over at a fixed price unbestiatingly revealed their factory methods, frankly laid have their relations to jobbers and retailers, and freely gave exact factors of manufacturing costs and retail selling prices. A laght a single fractable in which the lymite pelso-itsing arctern by manufacture to teles in experiment. Indicate we have with the meliculous care that has been vent overcharging. It seems to be axion gher the price to the ultimate ust be the buyers of the marnife fixing therefore, is a distinct blessing; it are a good article sold at a price so lew that al can afford to buy it

Something of the old cruitsman's pride in the quality of his work seems to enter into the making of patented at least that impression is left by the deat mony of a dozen able manufacturers. Palms are taken to select only sound raw material; the workmanning must be the best; the package must be substantial, nest, and inviting.

The psychological effect of such good m

principles and sound selling methods is inserimable. Confidence is inspired in the manufacturer and in the Confidence is inspired in the manufacturer and "in the patention article lease! Hardy has this possible been obtained, at the cost of years of effort and pickage millions in money, when the parasite appears—the density who contributes nothing to an art and who hatches no the energy of others. In his catalogues and advartisment's beamounce the sale of patented articles, sade popular by much advertising, at prices less than those sixed by the manufacturer. He violates the restrictions imposed upon him, although he knows that utilizately he will be brought to book by issued propagation. The he will be brought to book by legal proceedings. The psychological effect of his trickery is just as marked inventoring enter or ins frickety is just as marked as that produced by good manufacturing and selling methods. If this patented thing, sold elsewhere for never less than three dollars, can be bought for two dollars and atty-eight cents, does it not fellow, that all the other less familiar unpatented articles listful all all the other less faultier unpatented articles limit in the catalogue or advertisement can also be bought at prices lower than those charged ordinarily? Only by making the experience does the purchaser discover-that his reasoning is wrong; that he has been duped; that he has been made to pay an extortionate profit for a poorly made supatented thing, because the pat-ented goods of standard quality were sold below the standard price. Is it any wonder that the small re-tulier will refuse to deal in patented articles, the price of which has been fixed, if a larger desire, who can afford to lose money on one succited sevings machine. of which has been fixed, if a larger dealer, who can afford to lose money on one ractered sewing machine, for the purpose of making a profit on a thousand un-patented tables, chairs, flower pots and hat, is per-mitted to undersell him? Is it any wonder that for the retailers since and for the sake of the public, and consequently for their own sakes, manufacturers on-forces that necks the state of the public, and

force their price restrictions under the patent law?

It may be, as some contend, that the framers of the
Constitution never contemplated the extension of a patentee's rights so far that he can follow his article patentees rights so mr that he can follow his article into the hands of the ultimate consumer. But it may also be contended with more force that the framers of the Constitution never contemplated the restriction of a business that is based primarily on the confidence of the public in a patentee and in the thing that he has

#### High Speed and Good Rails

N view of the present unsatisfactory condition of the rail question in America, the average rail which is being placed in our tracks not being able to stand up with any certainty under heavy, fast traf-fic, the recent decision of the New York Central and fig. the recent decision of the New York Central and the Pennsylvania Hatifucads to reduce the speed of their eighteen-hour trains to Chicago is commendable. At the same time, it is a step backward. Time is be-coming so increasingly valuable in the indivistrial and commercial world that the femand of the public for high speed, both on sea and land, is justified. Great credit was given to these two milrodds when they insti-tuted the eighteen-hour schedule from New York to Chicago; and had the rail manufacturers kept pass with the progress of the railrodds, it would not now a mercathe progress of the railroads, it would not now be me sary to reduce the running time of these two fam

Trins reduction in train speed, following the recent recommendation of the governmental authorities, will have the good effect of emphasising the trayent need have the good effect of emphasising the trayent need which exists for the manufacture of absolutely secund rails. That such rails can be produced is proved by the fact that they are now being rolled east an eighter strickerbory service under heavy fast trained in Broppal strickerbory service under heavy fast trained in Broppal and the Manufacture of the carried at terms of the continuity of the stricker of the carried at terms of the continuity in the product of the carried at terms of the carried at terms of the carried at terms of the carried at the proposate, it is possible practically to decrease and the sufficient of the manufacturer and the containing the significant of the manufacturer and the containing the significance of the carried at the containing the significant of the training of the containing the significant of the containin This reduction in train speed, following the reand the second s

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The Chainstell Ford Flore for New York.—The Board of Santiaght of this city ways: the immediate construction of Santiaght of this city ways: the immediate construction of sights now pleas one thousand foot in length between Social-World Santiaght of the Santiaght of Santiaght Santiaght

correspondent by building the piece 1,200 feet in length.
Decide and Coaling Finate at Panagam.—The plan of Col. Gestblas for making Fanama a point of supply of each, oil, etc., for disping is one of the best collateral feet making Fanama a point of supply of each, oil, etc., for disping is one of the best collateral feet long will be built at Balbon on the Pacific side. Here also will be a dripock with a usable length of a thousand feet and depth of thirty-five feet, and a coaling plant storing and handling one hundred thousand tons of coal. Regate shope will be constructed which will handle large jobs of ropair and refitting. At Clristobel on the Albantle will be constructed several piece one thousand feet in length and a large coal storage plant, apable of handling and storing from 200,000 to 200,000 tons of coal.

The Causasse Tunnel.—The administration of the Bussian railways is seriously occupied with the project of a tennel of gigantic proportions theireigh the Causassus Mountains. This tunnel, the largest in the world, would laive a tength of marry 1815 miles, and it has been already the object of a conference between Ramina and foreign engineers, who have found: 1. That the geological struc-ture of the mountain does not present any treat obstathe copies or a source of the month of the copies of the mountain does not present any great obstactive of the mountain does not present any great obstacles. 2 That during the borings of the galleries no such difficulties will be emountered as during the borings of the Shapkor tunnel. 3. That is the temperature can be maintained as about 77 deg. Pair. 4. That the elevation of the tunnel being between 4,500 and 4,500 feet, there is no danger of encountering subtermanean water courses. 5. The work will also about eight years. This great undertaking would insure a direct connection between Vladineviane and Tills.

Ness Island Breakwater at Panama.—The piling for the great dign which is being built on the easterly side of the Panama sitrance on the Paoline, extending from the main land for three and one third miles, is nearing completion, land for three and one third miles, is nearing completion, only holder long all of the redevent will have been filled in. There has been much estimated necessiting learn additional dumpting of rook. The total vertical artistication in the research of the red has no carried to the surprise of 126 feet, and in some casted the more than to receive the universated of the sund has coarried to treatful laterally as much as 200 feet, but the fill has now stable, and a surriage way will be third indept for surriage way will be third indept for surriage way will be third indept for surriage way will be the surriage to surriage way will be the surriage to the surriage of sufficiently in the current which sate across the sate of the suntil sustantiace from the each.

Redutified as a Undebtorrousit Chem. L. Libout \$2,000,000

canil entenses Went the case).

Reveatibling as Underground Quest.—Rhout \$2,000,000 in to be explaned in rebuilding the underground section of the cannel leading from the Manne to the Whine. The Mariesaye surrout, as it is called; it is uffice long; it was built about \$0 years ago and carries the cannel under elevant of great and the carries of the cannel under elevant of great and the point. The old manner lining proving insufficient, a new and haven'de liming of beion is builty part is throughout the whole length. Nowigation may not be diopyed and the whole length. Nowigation may not be diopyed and the wint is exceed out on the Processed a system. Who allowed of working for those partials as a false. The passess consists of dividing the second 60th Subset section, such section being pumped, for 3 can half of the collaboration in the section of the passes of the carries of the section of the

Marine Albert

10 Taken

#### Electricity

Blockric Furnaces for SheBold Steel Works.—A new steel works to being built by the Stoble Steel Company of Steelshald, Rigidand, in rabino lony electrical steels mixing furnaces will be installed. At first the installation will comprise a 5-fon. 2-phase furnace, a 5-fon. 2-phase furnace for special steel, and small making furnace for adopts. This will be the first skil-electric steel works in

Cest of Meals in an Electrical Restaurant.—An Eng-lish electrical paper gives an interesting note of the prices charged in a popular London restaurant employing elec-ted cooking devices. The prices are said to be far less than those emocuntered in the West End restaurants, some those theountweet in som west and resonance, while the cooking is beyond represent. A simple lunch of soup, a thop with potato chips, mineral water and bread and conducting with a sweet and coffee, cost one shilling

The Cable Not to be Supplanted by Wireless.—An amountement recently made by the directors of an emergement recently made by the directors or an come cable company open more emphasizes the fagt that to distribute the distribute that the continue of the her regist expansion of wheless telegraph communica-tan. Just as in the fattillar case of a new rapid tramit uan. Just as in the meetiler case of a new rapid training system in a large city finding its own new business with-out staking from the traffic on exhibing means of transpor-tation, so the cable companies are finding that there is sample room for both the old and the new systems in the ing demand for transoceanie telegrap

Electric-light Carbons from Tar.—Carbons of high grade are now to be obtained from tar, according to a process travented by a Swedish firm. The providence carbon will be present to form electric-light carbons or larger sizes for electro-chemical work. The method is based on the fact that finsty-divided carbon makes up a large percentage of the composition of tar and is what gives the black color, this being due to the carbon particles suspended in an otherwise dense and transparent yellowish-brown liquid. A process is used for separating the carbon from the liquid, and it can then be molded into any desired shape. Electric-light Carbons from Tar.—Carbons of high

into any desired shape.

Heerite instead of Compressed-sir Cara.—Parisian
will not regret the disappearance of the compressed-sir
riamway cars which have been running for so many years
part, as these are now to be repined by electric cars.
The problam of surface traction in the eity was a difficult
cose in the early days, owing to the fact that the trolley is
practically prohibited within the city limits, and this led
to the use of compressed-sir cars of the double-deek type
with traffers, upon quite a number of the principal lines.
Now that the Thomson-Houston underground conduit
has proved such a success, it is to be adopted extensively
and the compressed-sir cars are likely to disappear. The
work of laying the conduits for the electric lines is now
going on in many of the principal streets.

Blue Gelsint Canage.—Baueroft's, method of owner.

Blue Gelsint Canage.—Baueroft's, method of owner.

Blue Gelatia Copper.—Baneroft's method of ornamenting copper, tiokral, brass or platinum is to make the metal the cathods in 325 cubic centimeters of a one per cent solution of copper acetate containing one gramme of cent sourced or copper accesse containing one gramme or gratain and electrifying for five minutes with a current density of nearly one half ampere to one hundred square centimeters of eathods surface. Immercion in a five per cent solution of copper accests after electrojus "de-velops" the depocis. If the plate is dipped in hydrazine velops" the deposit. If the plate is dipped in hydraxine before developing in the copper actate the action is hastened. A variety of colors may be given the film, but peacoick blass is the most beautiful. At temperatures above 50 dag. Cent. (122 dag. Fahr.) a red color appears and a subset describing between 55 dag. Cent. and 60 dag. Cent. with a lower amperage yields an irideneous gold film. The final touch is the application of a cost of leaquest.

Explosion Front Meters.—The United States Bureau of Mines, following an investigation having for its purpose to assertain the methods of lessening the risks attending his use of electricity in mining, refers to the pose to assertion the methods of lessening the rists attending sites see of electricity in mining, refers to the term "explosion proof" as applied to an electric motor as defining a uniform school of the property of the seed of the mining and the seed of the mining as surrounding with not just a mixture of the same gas surrounding with not just a mixture of the same gas surrounding whe motor. It appears that there are two classic fluid motors as constructed, one a totally inclosed on the seed of the seed

Dr. Carrel Saits for the Nobel Prize.—On the 26th of November Dr. Alexis Carrel sailed for Europe in order to receive the Nobel Prize.

A Memorial to W. T. Stead is to be provided by his countrymen, and a large and influential association has been formed in London to promote the enterprise. The memorial will probably take the form of hostels for women, in recognition of the fact that Stead was a knight-errant in the cause of womanhood. It is also proposed to creet a monument to the dead publicist on the Thames Embanismont.

The New Deutsches Museum of Munich.-The Industrial Museum of Munich, which is one of the most important institutions of the kind in Germany, is taking measures to increase the efficiency of the establishment and especially to add to the industrial collections in the way of models or specimens. To this end it decided to send a commission to the United States in order to examine the industrial field and visit the museums. The collections are at present installed in temporary quar-ters, but a handsome building is in construction for the se and it will be inaugurated in 1915.

A Monument to Berthelot,—A monument is to be rected at Paris to the celebrated chemist Berthelot, recently deceased, and the statue is now being finished by the sculptor Saint-Marceaux. It will be erected close to the College de France which forms part of the University buildings, and not far from the laboratory where he formerly worked. The statue is an upright figure, and to base contains a series of appropriate bas reliefs, also a list of his discoveries and works, with the inscription, "Marcellin Berthelot, 1827–1907. Monument erected by ational subscription."

Is Nuphthalene a Good Insecticide?—The question as so whether naphthalene is to be recommended as an insecticide is discussed by the French scientists Lecalilon and Audigo. This substance is commonly sold in the shape of small balls and is used in households, especially for preserving furs or various fabrics, but it appears that after being a favorite its use is falling off. They find that salest energies a worder to use its taking out. They mut that the totic effect only takes place in a confined atmosphere and its action is slow. Furs or garments should be thus preserved in as tight receptacles as possible. It can also be used in horticulture in greenhouses for protecting against aphides and the like, but it appears to have no effect upon earthworms.

The Science of Detecting Crime.—M. Bertillon, the well-known chief of the Paris anthropometric service, is engaged in giving a course of technical and practical police instruction to the new criminal brigade composed of 200 picked men of the police force. The courses which have now been organized at headquarters are likely to be of value in training the men, and instruction is given in different branches by several specialists. The pa M. Bertillon has in charge includes conference anthropometric service for identifying criminals, in which photographic views play an important part. Instruc-tion courses of this kind also exist in other countries of Europe

The Return of the Sea Serpent.—Capt. Ruser, who is now commander of the "Kaiserin Auguste Victoria" and has been designated to command the colossal "Imperais one of the best-known seamen on the Atla and respectful attention will be accorded to the state-ment in his log of July 5th, 1912 (as quoted in Annalen der Hydrographie) that at 6:30 A. M. of that day he, as der Hydrographte) that at 0.30 A. M. of this day he, as well as his first officer and an Elbe pilot who was on board, saw a see serpent in the water close alongside the ship, then off Prawle Point. The creature was 20 feet long, and appeared to be engaged in combat with some other marine animal, as it was lashing the sees violently with its tail. Its color was grayath blue on the back and whishin under the belly. The body was between a foot and a foot and a half in diameter. Capt. Ruser says that the whole length of the animal was visible, and there could be no mistake about its reptilian form.

Volcanic Dust in the Atmosphere,-From many points in America and Europe come reports of an unusual tur-bidity of the atmosphere, which began early last summer and still continues. This is manifested in a marked diminution of the intensity of solar radiation, as men ured with the pyrheliometer, abnormal displacement of the neutral points of atmospheric polarization, a hazy appearance of the sky, and the presence of Bishop's ring around the sun. From Dublin Sir John Moore wrote last "The sky is constantly covered with a thin film which the sun, moon, and stars shine with a subdued, sielly brightness." Observers in Russis, Switzerland, Sweden and Germany, as well as America, report an anneual lack of blueness in the sky. There seems to be svery reason to attribute these phenomena to the preswwwy reason to attribute these phenomena to the pres-cases in the upper atmosphere of an immense pall of dust arising from the explosive cruption of Katmai volcano, in Afacica, last June. Similar affacts a, last June. Similar effects were observed after uptions of Krakatoa and Mont Pelé, and in those

#### Street Paving With a Motor Truck By Theodore M. R. von Kéler

AN extraordinary vehicle recently appeared on the Astreets of Berlin, Germany. Resembling a railroad freight car, it rumbled along the pavements on wooden wheels with wide steel tires, and few of the passers by could imagine for what purpose it was intend-It stopped at a corner where paving was being done and there it resolved itself into a combination motor truck and pneumatic tamping machine, specially de-

signed for street paving with Belgian blocks

The motor is an 18 horse-power bent motor, which drives the truck itself and also a compressed air apparatus for the use of the pneumatic tamping tools. Instead of lifting and dropping the heavy old manis by hand at the rate of about fifteen a minute, the workmen place pneumatic tampers on the stone and the motor "does the rest" It delivers 90 blows per minute under pressure of six atmospheres, and enables one man to tamp 130 square yards in a day of eight hours. By hand the same man could only accomplish about 30 square yards. The use of the motor-driven apparatus has also had an unexpected influence on the wages of the workmen. While formerly it was necessary to choose men of superior physique and great endurance and to pay them high wages, it is now possible them high wages, it is now possible to use any ordinarily-built man to handle the pmeumatic machines. The work is com-paratively easy, and naturally the wages paid are smaller, despite the fact that each accomplishes four times the amount of work that the more powerful man formerly could perform.

The entire truck is surrounded by a heavy wooden "box" which can be locked and left at the place of street repairs, without necessitating the employment of a watchman to keep guard over it. The compressor can supply air to three eight men, while the truck pulls a trailer filled with stone blocks, sand and other erials needed in the work.

#### A Freak Racing Car By G. M. Sommers

W HILE the "Bedelia" racing car, ture, did not win the famous annual Gaillon hill climb, in Northern France, it

was easily the most talked-of machine seen in that event. With its extremely narrow, clongated shape it made an impression not easily forgotten.

The "Bedelia"—that is, the ordinary commercial "Bedelia"—is queer enough, but the racing variety is "Receils"—is queer enough, but the racing warsety is norbing more roless than a freak. As will be seen from the photograph, it is propelled by a two-cylinder v-shaped motor, which is cooled by at rwithout the assistance of a fan. Bower from the motor is tran-mitted to the rear wheels by means of a leather V-belt, running along the left side of the car. The wheels are of the disk variety—that is to say, the wire wheels are protected by thin sheets of metal against injury,

affording at the same time less resistance to the wind.

The huge gasoline tank is carried on top of the framework surrounding the motor, while the space imframework surrounding the motor, while the space im-mediately behind the power-plant, covered in the illus-tration by the numeral 75, is absolutely empty. The driver sits far back, almost directly over the rear wheels, and controls the front wheels by means of wases, and controls the front wases by means of wire cables, carried within the long hood, but issuing just in front of the motor. The rear wheels and axle carry the body by means of leaf springs of the more conventional type, sithough the method of suspending the load is somewhat unusual. The front

wheels are set on a tubular axle which supports the weight of the motor and gasoline tank on a spiral spring not un-like the so-called spring-frame arrangeent of some motorcycles.

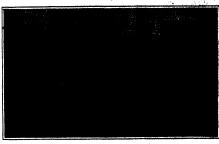
The ordinary "Badelta," of which a good

many are at present running on the streets of Paris, is a type of car which absolutely unknown in this country. It is a tandem-seated contrivance, in passenger sits in front of the driver. As far as the system of motor propulsion is concerned, it is the same as in the racing car: a two-cylinder V-motor, act racing car: a two-ylinder V-motor, acting on the rear wheels by means of a v-shaped leather belt. It is extremely light, so light, in fact, that two men can with ease lift the whole machine clear of

ound. It is fitted with Hutchin and is manufactured by R. Boupreau & H. Davaux, Paria. The ordinary "Bedelia" develops about \$\circ\$ to and is manufactured by K. Boupreau & R. Davaus, Paris. The ordinary "Bedelia" develops about & to 8 horse-power, and is capable of a speed of thirty miles an hour. The special racing model develops about 12 horse-power, and can attain a speed of a mile in a minute.

#### Anti-malerial Work

HOUGH there has been much anti-malarial pro-phylaxis in the United States since Anopholes has



A battery of pneumatic tampers at work.



The power plant for the pneumatic tampers.

been demonstrated to be the carrier of the plasmodium. this disease is yet far from being eliminated, especially in the South. The facts fundamental to malaria exon are well known; lack of success in any munity must mean that the modus operands has been quate and imperfect, the fault generally being that details have been neglected or ridiculed as too trivial for attention. A succinct statement of the pro-cedures adopted against malaria in the Canal Zone by Colonel Gorgas and his staff should not therefore be amiss. It is well known that conditions for anopheles breeding in the Panamanian Isthmus are ideal all the breeding in the Panamunian Isthmus are ideal all the year round; nowhere else on the globe could this mos-quito flourish so luxurianity, were not its breeding frustrated by antitary settence. When unlasts can be practically extinguished in such a region, the same thing can be done pretty much anywhere else. Organs measures in the order of their importance are: 1. The habitat of anopheles during the larval stage is destroyed within a hundred yards of dwellings. The larva of this mosquito live only as a rule in clear, fresh water

Gorgas, W. C., the Sanitary Organization of the 1sth-mian Canal, as it Bears Upon Anti-malarial Work. Jour. 4son. Military Surgeons of the U. S.



The "Bodolia," a freak routing cur.

e kee the o expected to the surface, there is no best for shoughtees: by means of a lines in the grass over the drain can be set. "I spen concreted dition may be put decem-ced here is nearly as much as for differcrete ditch must constantly be went dis-tions, in which breeding prois may form.

trough of which breeding piods may form. Open Stokes are the least effective and spot expensive. 3. All protections for the desire enqualty may be destroyed. The shalls are can the representation for the shalls are west on the wind, not generally fring the and needing plenty of gines and breast my representation against the wind. Brush and green are therefore cleared for a hundred yards around dwellings; where he locality is to be complete for a hundred yards around dwellings; where he locality is to be completed for a hundred yards around wellings; where he locality is to be completed for a law form of the best graded and gramed, the latter heapt well impress. There is no objection to a little shouldness or a fow trees shout a dwelling. S. All habitations are screened, but effectively. Becomes as ordinarily put up without expert supervision are of little use. Good wire should last three years; Good wire should last three years; there is plenty of acreening on the m that will not last six months. 4. When breeding places cannot be destroyed by draining, larves are destroyed by means of craining, invite are destroyed by means or crude petroleum, Phinotas oil and sui-phate of copper. The first of these is used in temporary pools, caused by bad construction, or at temporary samps where it would not be economical to-drain and wherever drainage is impracticable; the last two are used for killing the larvm in the sigm and grass along the edge of a lake, a stream or a swamp.

For those interested in the health of industrial camps, Gorgas makes some ex-ceedingly pregnant observations: In and about the Canal Zone fifty thousand laborers and their families are scattered over five hundred square miles, though they are principally collected in some forty camps and villages along the line of the canal; these five hundred square miles are divided into seventeen districts, all under a chief sanitary inspector, with the necessary clerical force and three assistants, of om one is especially wise in mosquito lore, the second expert in ditching, drain-ing, oiling, etc., the third a competent executive. Each one of the seventeen districts has its district inspector, who has from forty to fifty laborers to do the

necessary draining, carpenters to keep the screens in repair, and one or two quinine dispensers, who go repair, and one or two quantite dispensers, was go about uright though not compelling employees to take three-grain pills as prophylactic doses. The district in-spector reports deliy to the central office the number of malaria cases and the number of employees among whom the patients live. Each inspector is held responsible for any excess of malaria in his district. If the admission rate for mainta during the week rises above one and one half per cent something is considered wrong, and the assistants to the chief sanitary inspecwrong, and the assuscents to the cure sentiary support tor are sent to discover the cause. These assistants are moreover kept constantly bury over the work, advising and instructing the district inspectors. Herein Gorgas finds the gist of the whole situation; the disspector and the working force having usually no sectial knowledge of mosquito life and habits, must be constantly under the surveillance and supresse con-trol of the sanitary officer and his trained essential assistants, who should then be held responsible.

#### Natural Coke and Volcanic Graphite

PRESURAL Come and Volcanic Graphite
COEE is made in nature as well as in brick, resus.
CWhen hot volcanic material comes into contact with
a coal bed, under the proper conditions, it
makes very good cois indeed, although
not in sufficiently large deposits to be commercially valuable. Such mixtural coise is
often found by the geologist or the pro-

Graphite is also manufa coal by voicenic heating, said in this case the product is commercially important. Graphice is nearly gure carbon. In geo-Graphite is nearly pure earbon. In geo-logic examinations of the deposits of the Baton coal fields in New Magnio, Geologies Lee found none excellent examples, where coal had been metanosphospid fitto geoph-ics by comparatively research interimption of the coal being provened by the channes of the coal being provened by the channes of late. Man is now measure-turing graphite as well as other set of coal,

#### W Gan for Throwing Bombs and Life Lines By Jacques Boyer

and portain portable cannon recently invented by M. Hills is capable of throwing objects of considerate distance, but t great precision, which can be obtained only ut great pr n and small, heavy projectiles. The

gun, everer, was in which of fire is not dred Chief among these uses is the throwing of ing gases into the baunts of dangerous criminals, in ture the male out risking the lives of po-licemen. It may also be employed in war for throwing light light wreck for throwing life lines, and in confingrati o n s for scattering fire extinguish-

the advance of the dames. The accompanying drawing shows the Threwing a lifeline with the new Mathiot Gun. gun in section and in outline,

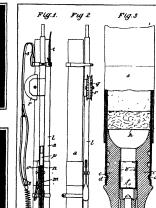
d cutting of

1 n s nowders

and also an enlarged section of the breech. The barrel and amo an entarged section or the presch. The barret, u, of large bere and varying in length from 28 to 43 taches, in different models, is securely attached to the breach block c by means of the groove d. The breech block contains a heuispherical cavity, with a cylindrical extension into which can be inserted the tube e, con a central-fire blank cartridge f, of the usual The cartridge is exploded by striking with the band the fist round head  $\lambda$  of the hammer g, and thus driving the point of the hammer against the fulminating cap. The shaft of the hammer is a square rod which moves with slight friction through the breech which moves with sight riction through the breech stopper 4. The outer end of this stopper carries a screw thread fitting a corresponding thread in the end of the breech. The stopper is screwed into the breech

With the will be a state of the state of the

until the rim of the hollow inner end of the stopper presses firmly upon the cartridge. This operation is effected by timing the head k; as the stopper necessarily rotates with the square rod  $\varphi$  after firing, the stopper is unscrewed and the gun is inclined until is unscrewed and use gun is inclined until the tube is slides out. The spent cartridge in the tube is then replaced by a fresh one, and the tube and stopper are again inserted in the breach. The hemispherical cavity in the breech block allows the gasses of combustion to



The gun in action behind a specially designed shield.

Fighting fire with the Mathiot gun.

Fig. 1.—Section of the gun. Fig. 2.—Front view. Fig. 3.-Section of breech

expand before they act on the wad k, which is inter-posed between the cartridge and the bomb or other projectile.

The gun is suspended from the body of the gunner by a novel- and ingenious harness, designed to minimize and distribute the shock of the recoil. The breech of the gun is attached by the spring u to the gridle x (see drawing) and additional support is given by straps passing over the shoulders and descending to the ground, where they terminate in loops in which the

In the first model adopted by the inventor the range was found by making trial shots with an attached spring gun I and noting the position which the sir Concluded on page 497.)

Liquefying and Bottling Illuminating Gas By Frank P. Peterson

GASES are the most fascinating of materials with which we have to deal. They represent matter in its final form, its permanent form, if it have such, and permanency approaches nearest to perfection of matter. In our past dealings with matter we have locked upon gases as the evidence of dissolution, decay, disruption, and it is only

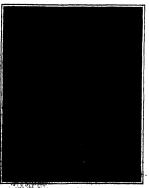
recently that we turn our minds to the restoration reconstructive we may apply our knowl of gases and their physical

adaptations. Since the adaptation gas to the supreme comfort of light and heat, until rewere willing to let it go at that. If we needed gas at any place, we compounded it. like nitro-glycerine, and used it, where required, because of its transportation. the similitude some people are likely to confound also the dangerous qualities of gas with the the deadly explosive Such

is far from a true conception, however, and the deterring influence has been cost, and not danger, of transportation. Every material thing has, or is capable of having,

Levery material think has, or is capable of having, three physical forms, the solid, the liquid, the gaseous. Transportation, as a simplified problem, deals with them in the inverse order as named, and it is not uninteresting to note that we transport the first two through the dynamic forces exerted by the third and we measure now by months the young art of adaptous form to such decreased bulk as n ing the gaseous form to such decreased bulk as permits us to handle, transport and deliver it as we do its component solid or liquid equivalent.

The coming of railway carriages of house proportions probably created the first extensive real need of



Dr. Walter & Smalling, gus setuined in liquid form to at It revaporises perfectly, even at agines perfectly, even at a tempera-



Service cabinet containing enough gas to last a small family two months. An empty bottle is replaced by a full one by loosening the nut indi-cated by the arrow at the left.

a transportable gas. The liability to wreckage and the a transporting disaster of lamp oil on fire made evident the direct necessity for departure from lamp oil. Then dame Pintach with compressed gas. And thereby was demonstrated first, the safety and, second, the posdemonstrated, irst, the sates, such as the economy of transporting gas. The greatest credit which is due to Pintsch is that he dismissed from the minds of the public the hobgoblin of fear of a compressed gas. After that came the transportation of vast volumes of natural gas compressed into such small bulk that it can find its way through long reaches small bulk that it can had be also be a sound to the normal bulk, when finally released and consumed. Pintsch could crowd somewhere in the neighborhood of 250 cubic feet of his gas where in the neighborhood of 200 cubic reet of his gas into a tank having a volume capacity of around 13 cubic feet. If the big gas main leading out of Hast-ings, W. Va., can comfortably deliver 2,400 feet of gas a minute at such pressures as are required at the burners, it can just as readily pass 57,000 cubic feet per minute along at the pressure it sustains of 350 pounds per square inch.

The volume of a gas, the temperature being always the same, is in inverse ratio to the pressure applied to compress it, the unit of pressure being 14.7 pounds per square inch, or one atmosphere, and this rule holds good just so long as the gas retains its gaseous character. Had Pintsch gone on in the application of greater presso long as the ras retains its gaseous character. Ind Pintsch gone on to the application of greater pres-sure to his gas he would presently have secured it, or a goodly portion of it, in a liquid form. There would have been some waste, however, in a portion which would not liquefy and also in a portion which would not regasify. So Pintsch, studying economy, stopped where he thought the best results were obtained. Blau and Linus Wolfe came later Going at the work on a much larger scale than Pintsch's early developments permitted, and with Pintsch's experience and accomplishments on record before them, these men were able to adapt the wastes to the form of useful energy to carry on the process, thereby forming a closed circuit in the operation and claiming much greater economy. in the operation and calming much greater economy.

It is a plty that Plushes stopped where he did, for the claims of Blau and Wolfe to greater economy are justified only in the lesser cost of transportation of a liquid as against a gaseous form of fuel. Even this claim is open to grave question, notwithstanding it is claim is open to grave question, notwithstanding it is accepted by some of the foremost economists, if the great captains of industry may be so classed. At any rate, Blau and Wolfe reached the goal of transforming gas fuel to liquid form. They were com-

pelled to use much greater pressures than Pintsch. Their efforts are rewarded with world-wide apprecia-tion and approval. These pioneers made their gas from They recognized only the safe source of large supply that oil seemed to insure.

Why, we may ask, do not the transporting companies at handle natural gas resort to the means of Blau and Wolfe in the handling of their gas? The answer and worte in the mining of their gas? The masses is twofold. It is, first, impractionable, because of the enormous pressure involved and the weight and strength of pipe thereby required, and finally impossible because of the abnormally low temperature demanded by natural gas to maintain it in the liquid form. They follow, therefore, consistently, Pintsch's compromise and compress the gas only to the reasonable and safe of strength of comparatively cheap, thin walled steel tubing.

Not until the compressing of natural gases from oil ells for gasoline justified a most extensive study of wells for gas their composition, was the most recent purely and adaptation to liquid form suggested. This extensive investigation was mentioned in a former article describing that interesting modern petroleum developm. gases are of widely varying general composition. They may be, and now are, classified in two great groups, dry gas and wet gas. The latter term is misleading dry gas and wet gas. The latter term is misleading when understood to have reference to water, though some fasses do carry suspended small percentages of water guideline. The wet gase may be separated into different compounds, both liquid and gaseous. The dry gases cannot be liqueded readity, and must, under all commercial conditions, retain their gaseous nature. No sooner is the fact recognized that these gases exist in sufficient quantity to justify their salvage and distri-bution to human comfort than we find the genius and the man of science ready to devote his time to it. Wal-ter O. Snelling, doctor of physics, of science and of chemistry, cast aside the obstacles and they fell, in the final perfection of the system of treatment to produce the new liquid gas, and he applied one of the most beaus imaginable.

Now every gas possesses a peculiar trait called its critical temperature, and it also has a corresponding critical pressure. This pressure matter it immaterial critical pressure. This presents matter is immaterial in some same because we done tunually acquire it without great effort. Beginning with the most prevalent of the component of complex nextural gases, such as here sensitively with the pressure, we must reduce it to emperate what the pressure, we must reduce it to emperate what the pressure, we must reduce it to emperate what the pressure, we must reduce it to emperate what the pressure, we must reduce it to emperate what the pressure, we must reduce it to emperate which is to be a support of the complex of the complex

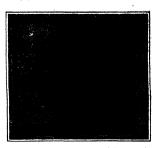
died and twenty five pounds per synthet such will seem when we have received this firstly state to referentement to liquid. After we have accomplished the result, and as soon as the 'temperature starts had, to result, and as soon as the 'emsperature share seek to normal, the pressure begins to 'jump up the scale. It appears then, that we will not attempt to liquefy this product on a commercial scale at least. Next, let us examine ethane, the second in the compound. If we use a temperature of 65 degrees above Fahr, we may liquefy it at 678 pounds pressure per equan tinch. Then let us take the third, propens, in the compound. The hundred and seventy degrees Fahr, and 640 pounds will do for its liquefaction, or any combination of leaver temperature and corresponding pressure may be used. Butane (and all the above named compounds may be found in the complex gases) will yield to 'maxingume of about 300 deg. Fahr, and 560 pounds, or correspond-ingly more reasonable figures.

of about 300 deg. Saar, and oou pommin, convergence, ingly more reasonable figures.

We find Dr. Suelling's ingenious mind generating such a chamber as will withstand any one of the thouse against pressures. Condensing colls, regulated in improvement pressures. Conceening coins, regulated as seventees to accommodate such of the compounds as like 4 in the new liquid, if need be, are set within the shail Now, it will be seen that, if a coil maintains, a thin ture in excess of that which is critical for any; of the fractions above mentioned, that fractions is condense upon that particular coil, but must to the next which affords the requisite physics to the next which shows the requisite physical condi-tion. Each coil is provided with its own receiver ar-ranged to separate the liquid condensing against at and to convey it outside of the main chamber, where, by means of strong cocks, it can be drawn eff. tive rectification" is the term applied, and it sees

tive rectification" is the term applied, and it seems to exactly express the idea.

The new liquid is used to light isolated residences, boats, vehicles, to cook and heat, for brasing; metal cutting, giass blowing and as a very promising anne-



The first practical demonstration of the use of the new liquefled gas was made in a sui

thetic. It is retained in the liquid form in strong steel bottles. For absolute safety it is placed in a cabinet, outside of a housing of any kind, on the top or outside of a boat or railway car. The butane, above mentioned, will readily liquefy, if the temperature got The butane, above much below zero Fahr., and some pentane, if we do not "rectify" it out, can be liquid at 99 deg. Fahr. Now, supposing the fractions are allowed to remain in the liquid gaseous compound, they tend to go over through the piping system in their liquid form, and, upon reaching the warm temperature of the interior of a living-room, the result is irregular expansion to of a living-roots, the result is irregular expansion to gaseous form, factuation of pressure and general de-fect of the perfect results sought. That all this has been carefully auticipated is evidenced by the fact that perfect revaporisation of this gas takes place at 40 degrees below zero Faku, and the steadings and even qualifies of the lights are remarkable under every kind of condition.

No pure gas has been found which will exist in the gaseous state through the range of pressure and temper-ature of the new gas and give its equal in heating value. From 2,200 to 2,400 British thermal units per cubic foot are registered for it, as against 1,800 to 1,900 for foot are regastered for 1, as-agantus 1,000 to 1,000 to the best artificial products in liquefied form, 1,575 for acctylene gas, 1,000 for good agtural gas, 650 for high-class Lowe process carbusetted water gas, 550 for

high-class Lowe process carusareptes water gan, tow not average coal retort gas, etc.

The pressure at which it is retained in the stock containers do not exceed 750 posseds under extreme con-ditions, such as exposure to held funchine. It is also ditions, such as exposure to hat susahine. It is also-lutely non-polosonas in the seines, of blood depiction, and when diluted with any designerable amount of air is neither dasperous nor officiaries to such. It is range of explosible-admixture with air is less than that they any other gas. It is put tassive darkiteles also packages and can be transpopuled to may distance and by any.

And, maley & to the co-tom of gament and, being supplement elimination of

usignificated lifetimetics and the state of the LLS per hold cube host.

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man's tife.

So, while on the score of past historical comparation
we should say comparatively little may happen to
chadge the organic character of a city's existence in
oran no long a time as 200 years, these comparisons are
not furnishing us an accurate lifes to what we may
overset in the future. expect in the future.

"It remains an open question, just what the Evans-ville of 2162 will be—a question for which there are as many solutions as individuals. But, at that, it is very interesting to think about."

Results of the Gordon Bennett Balloon Race

THE official result of the international balloon race for the Gordon Bennett Trophy, which started at Stuttgart on October 27th, was amounted on Nove ber 23d. The balloons were placed as follows: "Picardi." France, first, 2.191 kilometers (1.961 miles

514 furlougs). "
"He de France," France, second, 2,001 kilomete

(1,245 miles 5 furiougs).

"Unice Sano," United States, distance unrecorded.

"Tankfur," Austria, 1,709 kilometers (1,100 miles).

"Zurich," Switzerland, 1,523 kilometers (946 miles

furiones).

"Reichsfugverein," Germany, 1,885 kilometers (860

mlies 6 furiologs).
"Minckelers," Belgium, 1,391 kilometers (802 miles 8 furlongs).

"Honeymoon," England, 1,263 kilometers (778 miles 6 furlongs).

6 furious).

The other balloons covered less than 745 miles each while the "Million Population," America, made only while the "Million Population," America, made only Odd Kilomotope, (6014) miles.

The present of John Weste of St. Louis, segment the rules used of the trace of the "Department of The Trace of the Trac

Coppered Brass Deporation DESIGN, suttined in copper on a brass A Different outlined. In copper on a ten-chance on a toopper plate for verify setting can be obtained by covering the beam place chipstile of from and beauting a few minetile in well interest, displaces time from its easi-ing into induction. Since times in an along and size, the treatment remove the size of face layer. Of occurse from it deposition, in create in meshad it all l'omission of pervisors of plate is washed it all benses of, leavi

tion. Now said, a thir layer of paradin even the plant is trace the cedities desired in the paradin secretal down at the metal. Peer dilays using add desir-plate, and in a utilitie wash of and melt the plant if will be dynaffic itself and attached the plant of the plant of the plant of the plant of the when the plantin land been spreaded even. The de-crepts settled layer has been appeared to the planting because the planting is to be a prevent of the planting because the planting the planting the planting the planting because the planting the planting the planting the planting designs grateful for the design appears in helpful handless designs grateful.

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#### The Mint Crossovic Controversy

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The his Hillers of the Scriverspe Asimicary:

Illustration to the presences aspenses in the November (the same of the presence) are presented in the November (the same of the Scriverspe Asimicary). It is no provided to the Scriverspe Asimicary and the presence of the Scriverspe Asimicary and the presence of the Scriverspe Asimicary and the same of the Asimicary and the Scriverspeak (the provided Scriverspeak) and the scriverspeak (the provided Scriverspeak) and the scriverspeak (the scriperspeak) and the scriverspeak (the scriverspeak) and the scriverspeak (the scriperspeak) and the scriverspeak (the scriperspeak) and the scriverspeak (the scriperspeak) and the scriperspeak (the scri

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sites, and it is both legical and reasons...

Four separates to the short crossover is not only maps and securists, but in view of your position and the second seedless of this kind, there is no argument for a best crossover that appeals to a man of reasonable in-belligence, of any reasonable practical experience.

W. K. McCONERI.

#### The Solar Engine in Egypt

To the Editor of the SCIENTIFIC AMERICAN: To the againer of the Scientific American: On my resure from Egypt, I have been shown two let-ters from your valuable paper, the Scientific Ameri-can, one dated October 25th and the other October 31st. We constructed a fine sun-power plant in Egypt of 100

horse-power, and it started up excellently and gave some better results than we expected, but we had not calcu-lated on the intensity of the sunlight in Egypt, and the sine bollers, which stood very well in America, were un-able to hold out. The temperatures obtained came near aces to hold out. The temperatures obtained came near the melting point of sine, and the sine softened and hung down like a dish rag. We were therefore compelled to put in new holters, which are now being constructed in Eng-lead. These holders will be of one eighth inch thick steel, and every joint welded with oxy-acetylone. We feel sure these holders will stand the temperatures. Mean water rs will stand the temperatures.

space has also been given, and more steam space.

We expect to start up again about the end of March,
and will then be very glad to give you full information and photo

and photographs.

The pump we had in place could handle 6,500 gallons
per minuts. We found the engine could do much more
than run the pump, and therefore had arranged alrandy to increase the capacity of the pump to 12,000 gal-

eady to increase the capacity of the pump to 12,900 gal-one per minage, but before we could get this done, our others showed signs of failure. You can set from the above that the general proposi-jon of sun power is an assured success. The inventor of user has which harms with his bollers, should rather be apply about the matter's han officerying, as he evidently flexible better results than be. new mes vision herrus with his bollers, should rather be supply about the matcher hans officerwise, as he evidence that the supply about the matcher hans officerwise, as he evidence that the supply of the supply

#### Chartral of the Missis

Miles of the Seggerers Assessment Addition to note that you are dring space in commendations cathere to the discussion of the of the Mantaness. This subject like that of the Mantaness the subject the the total comme

**Maria Localita de la cista de la como** 

in a country of said rearring domining of population and thereads as not one.

I agree heavily with Mr. Youthe flast may work in this direction . . . should be priceded by intelligent understanding of the situation," but a heavily disagree with lains in thinking that "s choice must be made between some system of diversion or higher levece."

We must go at this job as at any other we wish to have properly done, namely, by beginning at the bottom. But the bottom of a rive system is at its top. That is where it starts, and that is where it can most readily be conthe contents and that is where it can most readily on controlled. We learn from our geographics that certain characteristics and facts pertain to all of that large class of rivers of which the Mississippi is one, namely, that their rise in hilly or mountainous these rives have their rise in hilly or mountainous regions; that they flow toward the ocean on beds which become more and more nearly level as their mouths are become more and more nearly level as their mouses approached; that moving water carries sediment and in proportion to the rate of its motion so long as it can find proportion to the rate of its motion so long as it can find the sediment to carry; that as the river reaches its lower and more nearly level portions it drops more and more of its sediment; that this causes the raising of its bed and the building of banks slightly higher than the surround-ing country; that with the constant raising of the banks and the bed there inevitably comes a time when the banks are broken through and the river finds a new course sense are process through and the river made a new course to the ocean; that the deposition of sediment causes the stream to become very tortuous, thus decreasing its motion and causing it to deposit a larger and larger pernt in its middle or sul centage of its seamment in its moute or star-moune sec-tions; and that as this process continues, the danger of sudden floods causing a break in the stream's banks becomes greater and the ensuing calamity more disas-

Now it follows from these observations that any plan of either building higher levees or providing additional outlets is but temporising with the problem. The higher levees must soon become, as they are to-day, a positive danger; and the additional outlet only doubles the time which may clapse before the one true plan must be

That plan, if my reason serves me correctly, is the construction of reservoirs in the upper courses and tribu-taries, in the case of the Mississippi the numerous tribu-taries of the Mississippi the numerous tribu-taries of the Mississippi the advantages of this plan are various.

From a national viewpoint it has the advantage of

From a spitional viswpoint it has the advantage of serving more than one section of the country. The reserving more than one section of the country. The reserving would be a great besiefing to that section of the continy in which they would be located, helping to increase the seast humsdiry of the atmosphere, relieving the monotony of the landscape, and furnishing means of tringation, ice making, fish outlure, various sport, and last and probably least in real value, some water power. But they would just as surely benefit the region of the lower Mississippt by reducing the danger of floods and at the same time is accessing the dependability of the river as a means of navigation. For the clarifying or partial clarifying of he waters of the lower Mississipply by means cifying of the waters of the lower Mississippi by means of these reservoirs would have the effect of making the river pick up instead of depositing sediment, which would have the further effect of causing the river to deepen its el and straighten its course (like the lake-fed St. Lawrence) thus increasing its rate of flow and still fur-ther increasing the desired result. And the most com-fortable part of the change thus wrought would be the knowledge that the benefit thus derived would be selfperpetuating instead of being mere postponements of an ever-increasing danger. Thus we have the advantage of urging the expenditure of the nation's money for a more truly national benefit than the mere relief of the lower

truly national benefit than the mere relief of the lower Missessippi by an additional outlet could possibly afford. Likewise, from an economic viewpoint the advantages would be marked. The first reservoir constructed would immediately take off the keen edge of the danger of a break in the present steven, a relief that might mean overything to thousands at the critical moment. There

everything to thousands at the critical moment. There would be no withing for the completion of a great undertaking of great expenses and somewhat doubtful utility before any advantage could be realized.

And last but by no means beat, from an engineering viewpoint, this plant offers the tremendous advantage of making its first work a perfect foundation for any further improvement of the Fathers of Waters which future generations, more opulent than ourselves, might wish to ndertake. Thus with the Northwest well supplied with rveirs, one does not have to stretch his imaginathese reserved;, one does not have to struck his imagina-tion greatly to see the time when the entire course of the Massagpi and Missouri rivers will be supplied with dams and looks and made into channels of commerce far more presentations than that now acked for in the feeble ory of "Receiptic feet through the valley;" Noting Atta, Connels. N. J. NORIZ. these re

#### As Aviator on Gyroscopic Force

To the addition of the Scientists American:
I was independed in the statement of R. S. Moore in your Geshier 19th Issue regarding the death of Paul Peols, the artistor.

Referring to Mr. Thomas Presson Brooks's argumen in the Scansteric Augusta's of September 28th, in which he attempted to prove that Peek's death was due to the gyroscopic action of the rotary motor in his aeroplane, I would say that Mr. Brooke has repeatedly claimed that various aviators have met their deaths from this terrible (?) force.

Did anyone hear of an aviator who has really had ex-Did anyone near or an aviator who has really had perfence with a rotary motor complain about the gyroscopic sotion? Mr. Brooke acknowledges that Paul Peek never had any trouble with gyroscopic force, and yet as soon as Peek is dead and is not here to defend himself, he blames his death upon this gyroscopic effect. If it was so dangerous and if it killed Mr. Peek, why didn't he at least know of its existence before his death? I have seen Paul Peck do some pretty fancy flying, and the fact that he never was aware of any gyroscopic action leads one to think that it was not very pronounced. There is no arguing the fact that there is a gyroscopic

effect when a rotary motor is used, but I claim, as a prac-tical aviator, that this fuss about gyroscopic action is all tical aviator, that this fuss about gyroscopic action is an nonsense, add it is abisolutely respirable in practice. As I have flown more miles in a monoplane, using a rotary motor, during the 1911 season, than any other American aviator, or I might go further and say than any other working from experision. aviator in America, I am speaking from experience. Neither have I an "ax to grind," as I am not in any way connected commercially with the development of the

There are enough impediments in the path of the development of the heavier-than-air flying machine without putting a lot of imaginary obstacles in its way, and I claim that this gyroscopic bugaboo falls under this head.

Newton Highlands, Mass. EARLE L. OVINGTON.

#### Wanted: A Small Gasoline Plow

To the Editor of the Scientific American: Under the foregoing heading Mr. E. M. Blacksher makes some remarks which I undertake to answer from the standpoint of the owner and operator of a gasoline plowing outfit.

Mr. Blacksher's observations are not new. Gasoline plows can be purchased in the American market at the present time. There are no mechanical difficulties in the way of manufacturing a successful machine. Only the question of economy is involved.

The farmer who is most likely to create a demand for the type of gasoline tractor referred to by Mr. Blacksher carries on diversified farming. He raises hay, corn, feed, and stock. He must have a number of horses to do tasks that cannot be performed with a tractor with any degree of success. He raises his own feed, and there is no reason why he should not raise his own horses. If he does, he is not likely to take a very lively interest in machinery.

In figuring the cost of plowing or hauling with ma-

chinery, at least four items must be considered

First of all is the interest on the first cost of the p plant. Second, is the cost of fuel, lubricants, etc. Third. comes the cost of labor. And fourth, some allowan must be made for depreciation.

The first item must be relatively large for a small outause for various reasons it is not possible to build a small tractor as cheaply per horse-power as a large one. The second item is also in favor of the larger tractor On the third item there can be no argument, because one On the third item there can be no argument, because one man can operate a large tractor quite as easily as a small one. A good man can drive a 60 horse-power tractor pulling eight plows and plowing twenty acres per day. It will take one man to operate a 15 horse-power tractor pulling two plows and to cover five acres per day. It takes just as much mechanical shility to operate the small tractor as the large one. The last item is much the same teactor as the targe one. The mast tent is intended the same as the third. Two engines of equal material and work-manship will make the same number of revolutions and cover the same number of miles before they are worn out, thing else being equal. The small travel four times as many miles to plow the same number

traver four times as many mines to plow the same number of acres as the large tractor. Therefore it will wear out four times as fast as the big one on the same acreage.

This comparison does not hold with horses, which is to the advantage of the small farmer. The real demand is not for a small tractor, but for a better large tractor. and for large tractors is real and urgent; demand for small tractors not nearly so important. comman for small tractors not nearly so important.

What is wanted is an engine that will operate successfully on the cheaper oils. This must be a Diesel or some modification of the Diesel engine. It must be better belanced than our present engines. The frame should be substantial, and hot-riveting should be used wherever The gearing should be of the best steel, and machined and inclosed so as to run in oil. This would

prevent rapid wear, because dirt could gain no access.

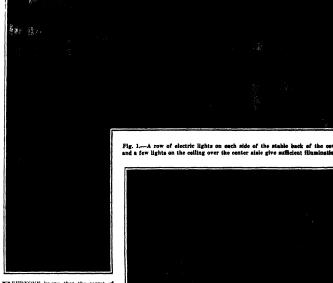
It would also prevent expensive delays and breakdowns.

An engine such as I have in mind would find a ready an engine such as I have in mind would find a read-sale among men of mechanical ability, men who would do the plowing and all the heavy work for small farmet more cheaply than the same work could possibly be don by a small machine. Judith Gap, Mont. INCOLF BIRKELAND

# How Electricity Makes the Dairy Cleaner

Watertight Electric Light Fixtures Permit of Thorough Daily Washing

By Putnam A. Bates, E.E.



EVERYONE knows that the secret of success in dairy farming is cleanli-

Where there are two commercial dairies in a community, the one giving the more attention to sanitation will naturally stand the higher in popular opinion, and this is true irrespective of other commercial conditions. But how may cleanliness be assured? Good light and plenty of good clean water are the requisites, of course. The question then becomes: How may these be obtained most conveniently?

Dairy farms are all improving very generally known, that 50 per cent of the large milk producing farms of this country to-day use electricity at least for lighting purposes, and in a considerable num-ber of such instances the current is also used for pumping and other power pur-

poses.

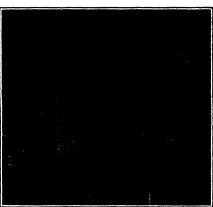
While the advantages of electricity lie not in cleanliness alone, undoubtedly where dairies are so equipped, this factor

proves the greatest benefit.

The writer's purpose is to describe the conditions at two of the leading dairies of New Jersey. The larger one comprises a farm of twelve hundred acres, at Plainsboro, N. J., 70 per cent of which is under cultivation. From 3,500 to 4,000 quarts of milk is the daily output of this dairy, and the milk finds a ready market at a good price. The milk is clean and the good price. The mins when and the conditions under which it has been pro-duced and shipped are such that no change can take place in its content until

change can take place in its consumer.

The engine room at this dairy is equipped with a 25 kilowatt electric gencoupped with a 25 kilowatt electric generator directly connected to a simple reciprocating steam engine. From this unit emanates much of the life and activity of the entire establishment. It is, perhaps, unjust to say that this is the mest important feature of the dairy, because \$\frac{1}{2} \cdot \frac{1}{2} \cdot \



-A row of electric lights on each side of the stable back of the ea

Fig. 2.—In this picture is shown a bottling room at a "certified" milk farm in Morristown, N. J. The hose is used twice daily to wash down the estire interior. In fact, all buildings at this farm undergo the same treatment.

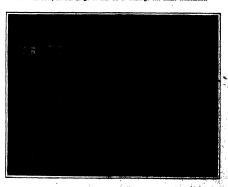


Fig. 3.—Milking at 3 A. M. by electric light seems a luxury, but for class milk it is a necessity.

there are a great many departments in such an enterprise, each having successfully to carry its burden. But it may be said, without prejudice, that as the curseat, whose prejudes, that is the cur-rent is used for lighting or power in each and every important building on the farm, should the electric service which this little set provides, for any reason fail, the loss would immediately affect the operation of all the other departments on the form

This is an evidence of the position which electricity holds in one of the larg-est and best equipped commercial dairies in America.

In the accompanying illustrations we show two interior views from a well-known dairy which supplies milk to several of our eastern cities and auburban communities. These are representative of its class, and, therefore, will serve for elucidation.

and, therefore, will serve for cluckation. Fig. 2 shows the bottling room in the other dairy, Morristown, N. J. This is a "cartified" milk dairy, and one of the requirements under which the product is produced is that the interior of all the milk buildings shall be washed down twice daily. In this room a watertight electric light facture is in the esting, directly over the bottling machine. No other means of permanent lighting could be used in such a place and permit of this rigorous cleaning. Pertable ofl interens are not clean, therefore they are terns are not clean, therefore they are quite, unsuitable for milkers to have to

quite, unsultable for millers to have to depend upon, in a sanitary datay.

One datay, the cow stables of "which are shown in Figs. 1 and 8, her made it as growth on the hasts of elemilitese. Sinch building, with employ in construction, her shoulding, with employing outpretending, an embodied in its design every dide, that will make for better emrillation.

In the upbuilding of this instinguise one of the first outpressed adopted was employed to the instinguish of the instinguish of

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# By Need J. Directs By Man J. Directs By Man J. Directs By Many Discourse no occurred newsdays that

Manifold level become to common horestage that the smallest dress and dismonsities required for surmination, one with favors; in most, almost every amministic dress and the smallest consistency of the smallest dress produced and operations of the radders, make the like pushions and operations of the radders, relates of the wing surfaces, and manuse of conmonsities of the wing surfaces, and manuse of conmonsities of the wing surfaces, and manuse of consistency of the surfaces will usually discover that is induced to the surfaces will usually discover that is induced to the surfaces will usually discover that is induced to the surfaces will usually discover that is induced to the surfaces of the surface of the radders of the surfaces will usually discover that is induced to the surface of the surface of the radders of the surfaces of the surface of the surface of the radders of the surfaces of the surface of the surface of the radders of the surface of the surface of the surface of the radders of the surface of the su

disposal.
ing had some experience with mamixing was some experience with ma-chipse, of this description, and having met all the difficulties enumerated, I will at-tempt to give some idea of the manner in which I overcome them, so that prospective builders will profit by my experience. The machine which I chose to build is the one described in Scientific American the one described is Sommurar American Sometiments No. 1882, with the slight difference that four feet was added to the span at the wings. I seen found that the redder was open to the triple objection that it was clumsy to operate, did not have enough working space and was so lew that on inading it was very liable to sty damaged. Accordingly the form of the support was changed to that shown in Fig. 1, which, of course, in-creased the angle through which the rudtrement the variety through which the rules that there was no more danger of injury. The control system , and seeting strangements which were employed are illustrated in Fig. 2. The seet is of are inuscrated in sig. 2. The seat is of canvas sequely sewed and so made that it may be slid back and forth readily on the supporting members to suit the oper-ator. The control consists of two parts, movable, as indicated by the arrows, that movable, as indicated by the arrows, that which moves the vertical rudder sliding laterally over the bar which centrols the horizontal rudder. The latter moves up and down and is guided upon two of the Both members of the control are struts. Soin memoers of the control are provided with wire hooks which pass entirely through the wooden har and re-ceive the loops in the picture-frame wire which is used for working the rudders. which is used for working the rudders. It may be observed that the hands need never be removed from this type of con-trol for working either of the rudders, and that it is much lighter, more positive, and has a greater range than has a lever. The rudder wires pass over light brass pulleys which may be purchased at any hardware store. A plan view of the rudder arrangements is shown in Fig. 3, while a lateral view is shown in Fig. 1. e are self explanatory.

Mides may be made so light and are so sear-teachle, that it is a wonder that they are not used more frequently. An idea of their construction may be gained from Fig. 1. They should be brased to the machine laterally by means of piano wire. In landing they should be allowed to support the weight of the machine only, the operator taking care of his own weight.

Using the construction which I have endoursed to describe, it will be found very easy to make the machine demountthis. The front and rear rudder supports and the skids may be removed and placed between or above the planes, and the whole will be found to occupy about one

South of the floor epoca regulard previously. To make this possible all control when should be provided with loops which may be slipped, over hooth when the machine, is bling prepared for an experiment. In my position the resource large land should slaway be securely lashed to the plane members with teather belt-incing in presiphency be being shifed, as able are not only heavy, but, slip very liable to weaken the frame if much skill is not used in attaching them.

is not quest-in attachtig them. This importance to make the dimensions to make this own type of machine; those given are instanced on make this own type of machine; those given are instanced on make the cap that for the pittler presented to in Scotterach Aussician Stormanier No. 1988; I have found these shares, to be controlly entitled the control of the control o

The Function of a University

N an address at Columbia University opening exacisase by F. J. E. Woothridge, Ph.D., dean of the graduate faculty, the speaker said that while mind is man's natural possession, the discovery of its use and significance in the life is a genuine discovery which calarges his vision, begate the sense of a new and unlimited power, and gives him a new conditione. An historian might claim that the discovery marks the important crisis of civilization. It is set down as one of the striking events which characterized the beginning of what we call modern times. Yet it is not sensething incident to an artificial period of time. It is the one event which makes it possible to regard the past as antiquity—the sum of things accomplished to view the present as opportunity, and to see the Such questions determine the point of view from which the repid expansion of our universities should be regarded. It is short-sighted to see in this expansion principally the abandoning of what is old and tried and the reabling into what is new and popular. We hear of 'new ideas of a university,' but in strictness of speech—or one might say, metaphysically—there can be no new idea of a university which is not a wrong idea. For there is a something Platonic and sternal about that idea, a changeless essence which may show that the can be called new is the sense in which we indicate that some one has seen it for the first time in his own experience. There may be new courses, new methods, and new degrees, and these may displace older and long established institutions, but there can be no new university. The accidents are

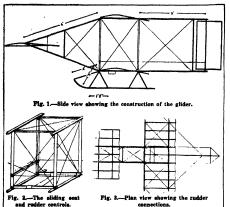
old or new university The accidents are old or new, the substance never; for the idea of the university is the idea of the organized discovery of the mind.

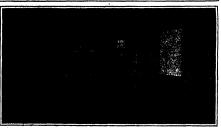
The university is, therefore, not simply a place where a number of people are engaged in teaching and being taught a number of subjects of greater or less importances. It is much more than a collection of different schools brought together under one administration for purposes of economy or size. It is much more than a haphasard arrangement of different courses leading to different degrees and framed to meet demands of the moment, or to lilustrate passing fashions, or to compete with rivals. To see no more is to see with myopic vision. To be sensible of no more is to be insensible to opportunity. The university is always at the beginning of a greater career when it finds a region which intelligence can invade and master, for that means progress in organizing the mind's discovery It looks with a fealous eye on every educational enterpless and every attempt to advance learning which seeks an independent existence.

We should enhance the belief that the university is in idea, and shall be increasingly in practice, the most important of human institutions. It sets faith in the controlling power of the mind in contrast with fulth in any other power It insists that a technique of curiosity, criticism, and control is superior to every kind of technique, because it is applicable to every undertaking. It de-mands, since there is always an intelligent and rational way of doing what needs and rational way of doing what needs doing, that that way be found and fol-lowed, not only in mathematics and phil-osophy, in literature and science, in In-dustry and the arts, but also in public life, in business, in politics, in society, in morals, and in religion. The proposition that we must think one way in the cioister, but must live and behave a different way in the market, is to it intolerable. The notion that we are the products of our ancestry, it supplements with the notion that we are the ancestors of posterity, making us thus indebted to the past, but obliged to the future. It aims to be the place to which men can look for judg-ments which are disinterested and, therefore, just. It is content only as it sees ignorance, prejudice, passion, partisan-ship, superstition, and privilege progres-

sively giving place to the life of reason. History may be read in terms of politics, or of seconomic forces, or as an evolution. It may also be read in terms of the discovery of the mind. We may see man rising from the ground startied by the first dim intimation that the things and forces about him are convertible and controllable. Curiosity excites him.

but he is subdeed by an untrained imagination. The things that frighten him, he tries to frighten. He would seare the earth's shadow from the moon and sacrifee his descret to a propitious sky. It avails not. But the little things teach him and discipline his imagination. He has kicked the stone that bruised him only to be bruised again. So he converts the stone into a weapon and hegins the subjugation of the world singing a song of triumph by the way. Such is his history in epitions—a blunder, a conversion, a conquest, and a song. That sequence he will repeat in greater things. He will repeat it yet and reploice where he now despairs, converting the chose of his social, political, industrial, and emotional life into wholesome force. He will sing again. But the discovery of the mind comes first, and then the song





Assembling the framework of the glider.



The glider at the instant of landing.

future should. It is not a characteristic of modernity,

Schools stelly because the mind has been discovered. Their physics propose is to keep us equalisted with the mind stell segments the intelligent penetration of things. If this is grow, then the discovery of the mind should be the source of our educational programmes and the estimation by which they should be judged. Are we making sophishes prevail? Are we invoking with the spitely designing very depertment of life? Are we besting an displace alty to bring under the control of reasonrishes them as well as the greatest undertakings of mei? Of such a type are the questions which those who helders that mind has been discovered will sake and they are the proper to the standards used questions.



1849. Harlem Railroad car, drawn by horses, passing the Tombs Prison.

In tracing the history of that great sys-tem of railroads known as the New York Central Lines, we must go back to the year 1832 in time, and in place to to the year 1832 in time, and in place to the City Hall Park, New York city. Here, on Center Street, was built the small ter-minal station of the New York and Harlem Railrond, whose double tracks were carried down Park Avenue and Center Street to a point near the City Hall. The cars were not nearly so large as, nor did they approach in comfort, our present street cars, and the locomotives could have been comfortably stowed within the firebox of the largest locomotive of the present day. The City Hall station was in the uptown district of the city of those days, but during the first two decades of the operation of the road, the growth of population and traffic northward on Manhattan Island, necessitated the con-struction of a new terminal farther up-town, and in the late fifties a new station was built at Twenty-sixth Street and Fourth Avenue on the present site of Madison Square Garden. The new struc-Madison Square Garden. The new struc-ture was considered to be one of the non-able buildings of the city of that day; yet it is a fact that it could be set down in the express concourse of the station of 1912, without touching the walls or reach-ing the roof above. In 1807 the use of steam locomotives south of Forty-second Struct was discontinued and for nearly Street was discontinued and for many years the cars were hauled to the City Hall and back by teams of horses. So rapid was the growth of the city, how-ever, and the increase in the traffic, that the company decided to build at Forty-

## Monumental Gate way to a Great City

Completing the Grand Central Terminal, New York



Application Application Application and the second of the

Part State of the State of the

twenty-four hours eightly-eight traites es-tered and left the station. During the trey are of operation four iniliates of people made use of the new terminal. Twenty-five years inter the station had to be entarged. Additional tracks were laid and the capacity cut the station had to be entarged. Additional tracks were laid and the capacity of the building wais increased by adding three stories above the old structure. This work was done in the year 1900. Searcely was the in-movement. completed, however, before it vement completed, how

#### Demand for Greater Facility

It now became clearly manifest to the management of the New York Central Railroad that, if adequate provision was



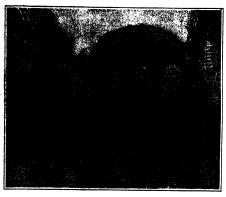
on a vastly greater

h of the estimate that at er New York dails in a radius of twenty-five to se. A large portion of this infinds its way through the Grand inst Transal; and it is accessary to die it, sight and morning, expeditions and with convenience both to the pubthe railroad companies, vice of express through trains

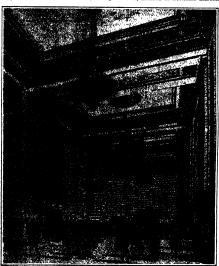
he hintered. The Truffe Prof raffic Problem. realise the difficulties which confronted the company in meet-ing existing conditions, it should be un-derstood that all the trains which enter the Grand Central Terminal have to new rough a four-track to Fifty-sixth Street, see the tracks diverge into the terminal Under previous methods of operathe trains ran into what are known "dead-end" tracks, under the train shed, where the passengers disembarked. The empty cars had then to be drawn sek to Mott Haven, to the north of the Harlem Biver, for cleaning and preparfor the next trip; after which they had to be drawn again through the tunnel into the terminal. It is evident that this arrangement practically doubled the trata move ments through the tunnel; or, in other words, exactly halved its capacity for passenger service. For some years it had been recognised that the ideal arnt would be to remove the storage and cleaning yard at Mott Haven to the terminal at Forty-second Street. This. however, would have necessitated a great rease in the size of the yard and large es of real estate at high prices. Outside of the objection on the score of t cost was the even more serious one of the noise, dust and smoke occa-sioned by the presence of an ever-increas-ing number of steam locomotives in the very heart of the city. The solution of the problem came, as it so often does in human affairs, in an unexpected way and from an unlooked for quarter. For there an be no question that the serious col lision in the tunnel, near the terminal yard, in January, 1902, occasioned by the failure of the engineer of a train to see amoke-and-steam-olis was the predisposing cause which led, nitimately, to the erection of the present secident resulted in legislation ny, which required the railroad, after a certain date, to substitute electrical for

operation through the Park Avenue tunnel. Electric Operation and "Air Rights."
p the New York Central Railroad Company found

ives confronted with the problem of electrifying



surse; a noble hall, 120 by 272 feet, finished in Botticino marble.



capable of accommodating five thousand people.

their terminal lines and station it was realized that they had before them a task of great difficulty, involving new problems and calling for the most careful deliberation. It was at once determined to take advan-

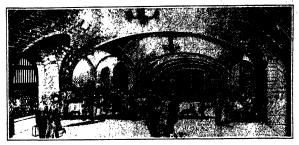
tage of the situation by building a new terminal on a scale of size and magnificence which had never been approached in any other terminal station in the world. This point being settled, the question arose as to how to secure the additional space necessary. The purchase of the twelve or fifteen city blocks that would be required would have involved a staggering outlay of money, which, added to the cost of electrification and of the great terminal structures which were contemplated, raised the total estimate of cost to a figwhich even this wealthy corporatio could not contemplate without some dismay. It was at this juncture that the chief engineer of the road, Mr. W J Wilrus, submitted to President Newman an alternative scheme, the merits of which were quickly appreciated and received the necessary indorsement. The plan was to utilize the "air rights" above the existing station yard, by placing the new yard and platforms entirely below the street level; roofing the tracks over; restoring the intersecting streets to city use; and utilizing the forty-six acres covered by the yard, by renting out the many blocks thus rendered available, for the construction of hotels, apartment houses, clubs and such other buildings as might be determined upon. The comparative estimate of the cost of a surface as against a sub surface station, showed that excavating below ground and building above ground, and thereby utilizing to the full the air rights, would yield to the company such large rentals that a good return would be realized, even upon the vast amount of capital invested

Direct Versus Alternating Current.

The substitution of electrical for steam traction having made it possible to utilize the air rights by building a terminal yard and station entirely below street level, the important question presented itself as to what system of electric traction would est meet the conditions President Newman quickly realized how vital a question There was no precedent whatever to go upon The conditions were new; the problem quite untried. over, at this time there were two great rival systems of electric traction in the field, the direct current and the alternating current. Very wisely, President Newman organized a special board of electrical and engineering experts to thrash out the question. They did so; and it took them two years to come to their nclusion that, all things considered, the direct-current, third-rail system would best meet the conditions. The New York, New Haven and Hartford Company also have their terminal at the Grand Central Station. The management determined to electrify their main lines as far as Stamford, Conn., and after mature consideration, they decided to adopt the alternating-current, high-tension system, 11,000 volts in an overhead line. T



netion is in progress. To the right is a section of the old yards. To the rear are the new post office building a of the extender level. In the comb



The restaurant with its fine vaulted ceiling.

York ("entral asburban electric zone was to extend thirty-four multes to trotun on the main line and thirty miles to White Plains on the Harlem. The direct-current system has the advantages that the third rail affords a more compact and ship-shape system of construction; that the pressure is lower; and that the raise of accident are reduced practically to the vanishing point. The company have done the electrical world great service by publishing very complete details of the ordinal cost, cost of operation, thereby placing the art of atoms, trunk-line electrification in possession of a large amount of very useful data. The New Haven Company has also published the facts as to convenience of operation, reduction of train movements, etc., but, unfortunately, they have been absolutely allent on the all-important question of the relative total coot of operation by the alternating-current system, as conserted with that of operation under steam. It is sincerely to be hoped that these important data will soon be forthcoming.

#### Some Facts and Figures.

Just here, before describing the work of building the yard and station, it will be well to give some facts and figures showing the magnitude of the task with which the architects and engineers were confronted in the first place, the total area of the station is seventy acres, which is exactly two and one half times as great as that of the next largest station, the Pennsylvania Terminal, Manhattan, which covers twenty-sight acres. It is over seven times as large as the area of

Comparative Statement—Principal Passenger Stations in the United States and Europe.

Commence and A. S.				
	Total Ar u, Acres	Length Truck, Miles	Number of Tracks	Number of Plat- forns
New Grand Contral Ter- minal	70 0	31 8 16 0	46* 21	30
Pennsylvauia. N Y. City Chicago & Northwestern.	28 0			11
Chicago St. Louis Union Station	10 9	5 4 15 0	16 32 32	16
Boston South Station Washington, Union Sta- tion	9 2 13 0	15 0		10
Cologne London, Waterloo Station	5.8	3 4	29 14 18	13 0
Dresden, Main Station Paris, St Lazare	8 75 7 0 11 2	3 0	14	.8
Frankfort Main Station .	iió		18	ů,

\* Of the total 68 tracks these 46 have platforms

the Boston South Station, and over six times the size of the Frankfort Main Station in Europe. It has a total of sixty-eight tracks, of which forty-six have platforms, as against twenty-one tracks in the Pennsylvania

Terminal, thirty-two in Roston and 8t. Louis Stations, and eighteen in the Frankfort Main Station. The work of piacing the two levels of the statiop below ground involved the excevation of three million-ieadber parks of material, chiefly rock, and houling it away for a distance of from ten to thirty-few miles from the station. Thirty-two miles of track had to be laid. The distance of troit, each station of steel, giases and stone had to be removed. In the construction of the roof of the suburban level, the viaducts at the cross streets and at Lark Avenue and the Main Building, there had to be erected no less than one hundred and eighteen thousand six hundred tons of steel work. This is over twice as much steel as was used in the construction of the existing subway in New York city and Brooklyn.

The freproording of the terminal—incesting the steel

The fireproofing of the terminal—incasing the steel work and building floors and partitions—called for 1,700,000 square feet of terra cotta hollow tile.

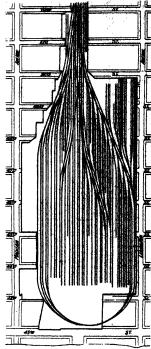
Indicates a gigantic task of construction under any circumstances; but when we bear in mind that the whole of this work or pulling down, of excavating, of building up, had to be done either below or by the side of the constantly-moving traffic of one of the greatest railway terminals in the world, and to be done without any interference whatever with that traffic, it will be admitted that the approaching successful completion of this great work reflects the highest credit upon every one concerned in its execution—management, engineers, architects, contractors, and the operating staff of their onlinearing achievements in works of great magnitude, and among these the building of the world's largest terminal under such exceptional difficulties most always remain one of the most discontinuations.

#### The Engineering Problem. ted, the engineering problem was to remov

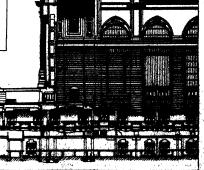
Briefly stated, the engineering problem was to remove the old train shed and terminal building; to excavate the whole forty-six and a half acres to

an average depth of 45 feet; to erect in the excavated area, the masslev columns and floor beams for carrying the express level tracks (a construction involving over sixty thousand tons of steel); to erect above this the viaduct and cross streets, restoring the original thoroughfares for use by the etty; to tear down and remove the old train shed with its extensive terminal building for office and general station uses; to erect the present magnificent structure, in which are housed the principal offices of the company and the various concourses, waiting rooms, etc., of the

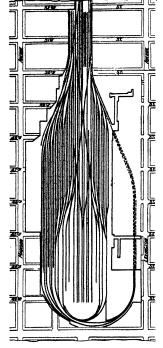
terminal; to lay down the their start with the fall in the yard and mation; and to do all of this within interfering with the require speciation of the instruming into and out of the mation. The year of our struction adopted and so suspecifying instruction adopted and so suspecsfully extract Arivan was to commence excretion on the seaterly or Los intro Areas aid; and as fast as the work we



The forty-one tracks of the express level.



d down to grade, to erect upon it the steel work for the two new levels, lay the tracks upon it, and transfer the trains gradually from the old to the new This plan has been followed out with great We draw attention to the view of the work ge 486, taken while it was in full swing, which at the left a completed section of the station yard



The twenty-seven tracks of the suburban level.



The suburban concourse, reached by the gentle incline to the left.

and tracks with electric trains standing upon them the center is the work of exeavation, and to the right a section of the original yard. In the background, to the left, is shown the new post office building, in which are housed also a great many of the managing and cherical offices of the railroad. In the center is the old station train shed and terminal building. The work has progressed gradually from east to west, and to-day the remaining excuvation below Vanderbilt Avenue is being pushed to completion

#### A New Civic Center. By referring to our front page engraving, it will be

seen that for the present, the station yard tracks will seen that not the present, the starton yard tracks will be explosed to tels in the area north of the station; ultimetely, however, these spaces will be covered by buildings designed to present as far as possible a monu-mental effect; and it is probable that the buildings will include museums, hotels, business blocks, then ters, clubs and other structures which admit of bold architectural treatment on a large scale. If the present plans are carried out, the buildings will be crected by the Railroad Company and leased for a long term, probably ninety-nine years. The cost of the buildings will be repaid to the company in yearly installments. Such a plan has the great advantage that the ratifood company can reserve the right to exercise a strict supervision over the architectural features of the building, which, as far as possible, will be of classical or semi-classical treatment. A unique and highly com-mendable feature is the fact that, when the thirtytwo blocks of the station site have been built over, they will contain but two chimneys—these being the two smokestacks of the terminal power house, situated in one corner of the site, at Fiftleth Street and Lexington Avenue. All light and heat for the buildings will be furnished from this power house. Ultimately, when the whole area shall have been covered in, there will

rise upon the site of the old and unsightly vard with its smoke and dirt and noise, a new section of the city. which in the dignity and harmony of its architecture will be unequaled in any part of Greater New York.

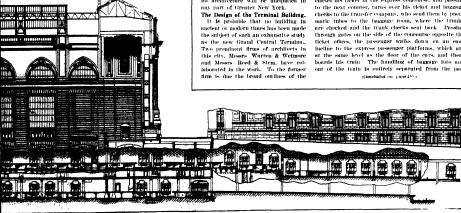
design and what might be termed the general asthetic treatment of the subject, while the latter firm are responsible for what might be called the engineer-architect feature of the work. There is a general consensus of public opinion that this collaboration has resulted in a building of which the city may justly be proud. Among the great terminal stations of the world, we know of none that surpasses this in the conformity of its architecture to the purposes of the building. The general effect is one of great dignity and beauty, and the decorative features have been so judiciously applied that they fulfill their proper purpose of accentuating the principal architectural ele-ments of the structure rather than, as is so often the case, detracting from them

As forming the commercial gateway for a great system of railways to the heart of the country's greatest city, the Forty-second Street façade, crowned by its imposing group of statuary, must be pronounced a notable architectural success

Interior Arrangement of the Terminal.

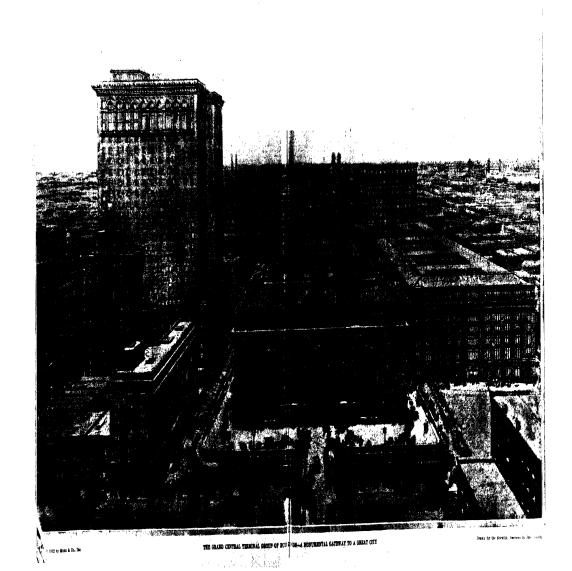
The new terminal station will have four separate tels. At the grade of Forty-second Street will be the gallety; below that the great concourse on the level of the forty-one tracks that will handle the through express trains. On the third level will be twenty-seven tracks for the suburban trains; and below these, running east and west below Forty-third and Forty-fifth streets, will be subways for handling the inbound and outbound baggage

Great attention was paid to the problem of separat-ing the inbound from the outbound traffic, so as to besure that the passengers and their baggage would flow in an unbroken stream from street to train or from train to street. As part of this plan, it was from train to street. As part of this plan, it was decided to aboths statiswas and substitute inclined planes or "ramps" as they are called, which, after nucle experimentation, were built on a grade of cight feet rise to every hundred feet of length. To avoid congestion no less than twicks experime carrances to the station have been provided. The passenger purchases his ticket in the express concourse, and passing to the next counter, turns over his ticket and baggage checks to the transfer company, who send them by pneumatic tubes to the baggage room, where the trunks are checked and the trunk checks sent back. Passing through gates on the side of the concourse opposite the ticket offices, the passenger walks down on an easy incline to the express passenger platforms, which are at the same level as the floor of the cars, and there boards his train. The handling of baggage into and out of the train is entirely separated from the pas-



so and terminal building.

st office and general railroad office building.



## Inventions New and Interesting

Simple Patent Law ; Patent Office News . Notes on Tendemarks

#### The Hen Her Own Bookkeeper

NO matter how shewed at staling ut a line he may think he is no positryman cau tell with any description which are his best layers with all keeping and actual ree red of the having. As in their walks of life he credit is quite litable to go to the occational inverbad working and a staling and the credit is quite litable to go to the occational inverbady managed. In order to determine his much dipendence can be put in the judgment of a polityman a careful record was kept at an experiment farm in Minnesota. In very fee cases did the estimate tally managed in the staling of the staling was a staling and a matter of fact oally 81 in the vara months hen rated at 305 (17 vent laid cut). 40 in the vara months the rated at 305 (17 vent laid cut). 40 in the work months are reported from this experiment staling his what it is absolutely necessary for a poultryman it keep accurate records Otherwise he cannot weed out the por layers from the g of but must let the 1/12 hu continue to at any the profits of the others. As not knowing the mother of the eag he wan the poultryman breed good layers and price poultry. An accurate pedigree is impossible without constant and to done waterling.

After cogliating on this matter for some time two



A battery of four nests one with the

States, Island poults mut conceived the idea of kitting the hou lead per can record. The tried out the scheme and from the lart is writed by feetlon. The feet is not that it we rised by feetlon. The feet is not that they were surprised when applying for a patent of find that many others had been endeavoring by devices in my scheme for keeping an amount of each of the mention when applying for a patent of find that many others had been endeavoring by devices in my state of the mention which having the same object in view thir methods were entirely offerent 8 man of required so much if the hour that no soil trajecting first with all enter them. Bowever the apparatus deviced by those two inventors calls for no work on the part of the hear until she heaves the next and then all that she has to do is to stoop under a gate that partially of see the antrauch. By so



Entering the nest and springing the gate-trigger.



Crawling out of the nest and registering her sutograph.

doing she registers her autograph on a piece of paper.

As shown in the drawing the hen walks up an in clined board to the nest. In so doing she strikes a trigger that releases two gates, which drop down and bar the entrance to any other hen. The inner gate is hung high enough to permit the hen to crawl under it. This is no hardship for the fowl which no doubt has been educated to crawl under fences. But in squatting so as to crawl under the gate, the hen is obliged to bring a crayon strapped to her leg auto contact with a piece of paper on the inclined board thus leaving her autograph after passing out of the nest The outer gate is easily negotiated for it consists of a light wire frame that swings outward readily shough However this frame will not swing inward and so acts as a ugainst the entrance of any other heas to the neet inclined board is mounted on a spring at its inner end so as to make the nest adeptable to hens of various sizes. After the egg has been laid the nest remains ed until the poultryman arrives to reset and remove the ogg and autograph record of the hen Fo distinguish between hens, each is provided with an individual color and if there are not colors enough to go tound combinations of colors are provided for a a hell may wear a crayon on each leg. The crayon helders as shown in the drawing are secured like the steel spurs of the fighting cock and are made of siuminium. They are so light and fit so well that the simminum aboy are so man and m so wer time the hen does not notice them any more than one notices the ring on his finger. It has been found that the crayons last from six to tight weeks without any attention whatever. Although the device may attike us as arms ing because of its movelty it has clearly moved its efficiency and is being extensively introduced among

A Statistical Eye for Section of Control of Statistics of Particles and Statistics of Statistics of

to a common receiver, when is consumed as postores. In the field of a large horseshoot measure it waspended at thin wire, given a foot in length This carrier a very light rectaingular aluminium frame, received with a raivanometer wire. The galanometer cost i weight about an ounce and has an electrical resistance of five thousand olums. One terminal of the coll disp, kind.



The aluminium crayen-helder on the

a cup of moreurs R while the other connects with the suspension wire. The transmitter or mechanical eye D is placed in circuit with betters B, coil A and mercury cup B. When a ray of light falls on the coil D it varies the strength of the certrent peaking through the coil A causing it to turn, bringing its lower terminal into coaster with one or other of the seat-erews F and thereby closing a relay circuit containing the starm gong G. The secutiveness of the receiver may be varied by adjusting the screws F. The charm-book is extended through the intermediary of a jeck similar to that used in telephone switchboards, so that once the circuit is closed the bell will continue to ring until it is stopped by threawing a switch. Edgisped with this salarm spiparatch he good man of the house cuts slums of the necessary of the contribution of t

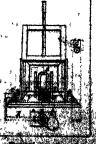


The middlesking scientum oye, on the watch



Me instrument bint racelyan ti





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Never in its history has Cadillac enthusiasm been so strong; so widespread, so pervasive as now,

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The handsome lines, the deep soft upholsery, the yielding springs, the riding qualities of almost velvety smoothness; the quiet engine of abundant power, the dexibility and the remarkable case of control; the sandardisesion of para, the durability, the simplicity and the scoromy of maintenance; the practicity 100 per cent efficient Caddiac Delco electrical system of automatic self-cranking and electric lighting, now in its second caccerpal year on the Caddiac; these and almost countless other marks of distinction, stamp the Caddiac as a car which leaves nothing to be desired, nothing really worth while which a greater expenditure will procure.

The Cadillac production is large 15,000 cars for 1913 just one of the great elements which make possible the Cadillac car at the Cadillac price.

Server the new model was amounced, dealers had contracted for this entire enormous output. They had also places, orders for several thousand mera, our acceptance of these additional orders being condtional upon our being able by some means to supply them.

Without seeing the car or even its photograph, more than 3,000 individual purchasers placed their signed orders. They had confidence in the Cadillac car and in the Cadillac Company.

Four thousand of the new cars which have already been delivered have vastly intensified the early enthusiasm. They are proving that the confidence was not misplaced. They are confirming the wisdom of those who placed their orders in advance.

Nearly everyone you meet is—to use a common expression—"Sold on the Cadillac." There seems to be almost none left who are not convinced of Cadillac pre-eminence.

As we said at the outset: We believe that orders for nearly every 1913 Cadillac—including those for spring and summer deliveries—will be placed before winter is half over.

It behooves you, therefore, to arrange for as early a delivery as your dealer can give you.

By heeding this advice—given you in all sincerity—you will avoid disappointment. You will also avoid the necessity of compromising on some other car—a proceeding which almost invariably results in an unsatisfied longing in the mind of the man who has once concluded that the Cadille c is the car he want.





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its thermal efficiency is not more than 2%.

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e famous Tractors give the farmer CHEAP POWER, and plenty of it.

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See next week's Bulletin

#### G. V. Industrial **Trucks**

G. V. Electric Trucks were the pioneer Electrics and they are the leaders still. Thousands in use. They already dominate the commercial electric field and we shall treble production facilities in 1913

G. V. Industrial Trucks supplant, among other things, that wasteful institution, the two wheeled hand truck. In freight terminals, industrial plants and private warehouses, one truck operated by one man will haul one ton of miscellaneous freight 200 yards in one third the time five men would be delivering a load with hand trucks.



The truck here illustrated is used in several sizes by the N. Y. Central & Hudson River R. R., D. L. & W., Illinois Central, Central of Georgia, Clyde Steamship Co., Pacific Mills, Winchester Repeating Arms Co., Boston Mfg. Co., etc., etc., and scores more are building for railroads, textile mills and manufacturing plants.

The operator (an ordinary freight handler) rides on the truck, guiding it anywhere, at 7 miles per hour. This type is about 4x7 feet, has a capacity of 2000 pounds, a weight of 1750 pounds, and a mileage on one charge of 25 miles. The cost of current is as low as 1c per mile.

The G. V. Industrial Truck is the simplest of all similar trucks electrically propelled. It has single reduction gearing and one motor only. Orders are solicited now for early 1913 deliveries.

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#### The General Vehicle Co., Inc.

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#### Simplifying Court Procedure in Patent Cases

N EARLY all the witnesses before the House Committee on Patents upon the hearings on the Oldfield bill for the rehearings on the Oddfield bill for the re-vision of the patent law, and all the wri-ters who have discussed patents in the Sometifie American and Suprimerry, agree that the patent laws of the United agree that the patent laws of the United States, so far as they define the right of patent owners, are fundamentally sound, but that all the imperfections which have been imputed to the patent law can be traced to matters of practice and procedure. How were the patent and procedure. How such improve can be effected, without any action on the part of Congress, but simply by set of the courts themselves, has been strikingly

So notable have been the changes in practice and procedure accomplished by practice and procedure accomplished by the courts themselves, during the past few months, that it can safely be said that by these changes more has been accom-plished to insure perfect operation of the plished to insure perfect operation of the patent laws than would have been ac-complished had all the proposals for changing the patent system which have been agitated with increasing fervor in Congress during the past few years been macted and carried into execution. The first change related to an evil which

patent lawyers have frequently comment-ed on and which lay at the bottom of the case of Westinghouse Company v. Wagnet Company, 178 Fed., 361. In that case the Court of Appeals for the Eighth Circuit had affirmed a rule under which all an man aurment a rule under which all an infringer has to do to secure himself against a recovery of profits is to add something of his own to the complainant's device, a thing which can be easily done

device, a thing which can be sainly done
in almost any case.
On June 7th, 1912, however, without
waiting for any amendments to the law,
the Supreme Court of the United States ipon an appeal from the case above cited. Westinghouse Electric and Manufa Company v. Wagner Electric and Manu Company v. Wagner Electric and aganu-facturing Company (225 U. S., 604), re-versed the decree of the Circuit Court of Appeals. By this decision of the Su-preme Court the following propositions of law became established: If the infringer has sold or used a patented article, the patentee is entitled to recover all of the profits. If a patent, though using old elements, gives the entire value to the combination, the patentee is entitled to recover from an infringer all the profits. If profits are made by using an article patented as an entirety, the infringer is liable for all the profits, unless he can show, and the burden is on him, that the profits are parity the result of some other things need by him. If the infringer, however, by commingling the elements renders it impossible for the patentse to meet the requirement of apportionment, the entire inseparable profit must be given The multir function in a special control to the patenties. In such a stan, as in that of a trustee or satisfact of a trust or given to the patenties. In such a stan, as in that of a trustee or satisfact or said rot out the temperat. This rule applies even if the patential plates that have been place even if the patential plates and the same of the same

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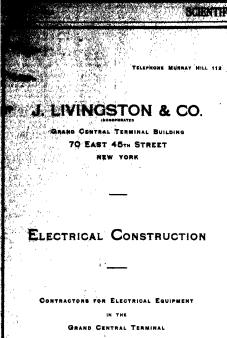
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The other changes which have corrected the practice and procedure under the pat-ent law in the chief respects in which ent law in the chief respects in white they have been criticised, were accoun-plished on November 4th, 1932, by the Supreme Court of the United States when the Court promulgated its Baylese Rules of Practice for the Courts of Equity of the United States.

The chief criticism directed against the existing patent system has always been that in patent litigation testingony was that in patent intigation testingmy was ordinarily taken, not in court before a judge, whose good offices could be relied upon to expedite the trial, but out of ourt before an examiner, who was pow s to control the length of the exam ination or the prolixity of the ter Thus, it was possible to expand the testi mony to unseemly length and thus inter intolerable delays, and well-nig prohibitive expense upon the weaker liti gant. There was also the possibility tha even after this enormous bulk of testi-mony had eventually been passed upon by the court and a decree made thereon the Appellate Court might reverse the de cree and send the whole cause back for a new trial, involving a repetition of the same tedious performance. How this has een revolutionised by the New Bules pro mulgated by the Supreme Court appears from several of the Rules them

New Rule 46, relating to trials, requires that testimony shall, except in extraordi-nary cases, be taken in open court. "In all trials in equity," says New Rule 46, the testimony of witnesses shall be taker orally in open court, except as otherwise provided by statute or these rules. The Court shall pass upon the admissibility of all evidence offered as in actions at When evidence is offered and exded, and the party against whom the ruling is made excents thereto at the time, the Court shall take and report so respecting it, as will clearly show the character of the evidence, the form in which it was offered, the objection made, the ruling, and the exception. If the Appeliate Court shall be of opinion that the evidence should have been admitted, it shall not reverse the decree unless it be clearly of opinion that material prejudice will result from an affirmance, in which event it shall direct such further steps as justice may require."

New Rule 47 is even more explicit;
"The court, upon application of either
party, when allowed by statute, or for
good and exceptional cause for departing from the general rule, to be shown by affidavit, may permit the deposition of named witnesses, to be used before the court or upon a reference to a master to be taken before an examiner or other named officer, upon the notice and terms specified in the order. All deposition taken under a statute, or under any such order of the Court, shall be taken and filed as follows, unless otherwise ordered by the Court or judge interwise ordered by the Court or judge intil within sixty days from the time the cause is at issue; those of the defendant within thirty days from se expiration of the time for the filing of plaintiff's depositions; and rebutting depositions by either party within twenty days after the time for taking original sitions expires."

New Bule 48 deals directly with the sorest subject of patent practice, insustly, the testimony of expert witnesses in patent and trade-mark causes. "In a case involving the validity or scope of a pat-ent or trademark," says the rule, "the District Court may, upon position, order that the testimony in chief of expert witwhose testimony is directed to nesses, whose testimony is directed to masters of opinion, be set forth in all-daytts and filed as follows: Those of the planticly within love; days either the cause is at same: those of the desipolant within twenty days either glassicity than his express!, and submission entitles; within, pieces, days either the expression of the time for mine original anticopies.







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describe of any affiant for cross-examinadess, the Court or judge shall, on motion, direct that said cross-examination and Court upon the trial, and unless the Court upon the trial, and unless the affiant is produced and submits to crossexamination in complisme with such direction, his affidavit shall not be used as evidence in the cune."

urrection, my amount's salal not be used as evidence in the cause."

The seal of the Supreme Court of the United States to prevent prolitity of teeti-mony and undue expansion of the record appears throughout the New Rules. Thus, depositions before an examiner are expressly permitted to be in narrative form instead of in question and answer. (New Rule 49.) No transcript of evidence before the examiner can include argument or debate. (New Rule 51.)

"The ortdence to be included in the record (on appeal) whall not be set forth in full, but shall be stated in simple and condensed form, all parts not essential to the dectaion of the quiestions presented by the appeal being omitted and the testimony of witnesses being stated only in narrative form, save that if either party desires it, and the Court or judge so directs, any part of the testimony shall be reproduced in the exact words of the witness." (Now Rule 75.)

"In preparing the transcript on an appeal, especial care shall be taken to avoid the inclusion of more than one copy of the same paper and to exclude the formal and immaterial parts of all exhibits, documents and other pupers included the formal rand for any infraction of this or any kindred rule the Appellate Court may withhold or impose costs as the circumstances of the case and the discouragement of like infractions in the future may require. Costs for such an infraction may be imposed upon offending solicitors as well as parties." (New Rule 78.)

The determination of the Supreme Court to stamp out the common devices by which patent litigation has heretofore been made burdensome is notably expressed in the rule last quoted.

The way of the procrastinator in patent littgation will hereafter be hard. "After the time has elapsed," says New Rule 86, "for taking and filing depositions under these rules, the case shall be placed on the trial calendar. Thereafter no further testimony by deposition shall be laken except for some strong reason shown by affadwit. In every such application the reason why the testimony of the witness cannot be had only on the trial, and why his deposition has not been before taken, shall be set forth, together with the testimony which it is expected the witness will give."

"After a cause shall be placed on the trial calendar," says New Rule 57, "it may be passed over to another day of the same term, by consent of counsel or order of the Court, but shall not be continued beyond the term save in exceptional cases by order of the Court upon good cause shown by affidavit and upon good cause the count of the cause of the cause

The New Rules above quoted will go into effect February 1st, 1918. Alone, and without the necessity of any assendment in the law, they have removed the chief grounds for criticism of the expiting patent system. Still more implexion, they point the way to smiller changes in practice, which the Fatest Office, libed, without the necessity of any act of Congress, may effect in the Fatest Office, Finally, they illustrate the futility of seeking, by fundamental changes in the patent system and radden lackingment of the rights of the stights of settings.



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At all and Sh TED STATES RUSSER GO

AVERY interesting pity as hin New York depicts a manufacture of a silent-shooting places.

Herent scenes where the places is are most impressive and interas many people are bound to get an alto-gether mistaken notion of what can be done in real life with a firearms stiencer, it seems worth while to point out som little known information on the subject

In the play a crook is supposed to have acquired a pistol with a sitencer attached to it. He demonstrates it to his friend particularly shooting at a vase of flowers standing on a table. He smaahes the vase, or a least the wase large and there standing on a table He smaahes the wase, or at least, the vage is mashed and there is no noise from the pistol Leker on in committing a burgiary he is betrayed by one of his supposed pais. He shoots his betrayer noiselessly with this gistol while the police are waiting in the next white the possess are waiting in the very room and secupes. The police are entirely ignorant of what has occurred. The impression given is that all the real crook need do in order to duplicate in real life what he saw on the stage, is to buy a silencer and attach it to his pistol and go ahead. Fortunately this is not at all the case, as can be easily seen from a moment s glance of any pistol. There are two forms of pistols in use

One is the revolver and the other It-oday. One is the revolver and the other is the automatic pistol. These are the only hand arms which can be secreted and used by the law breater with any chance of escaping detection. Let us see what happens when we try to allence one of these weepons. The revolver has a cylin der usually carrying six cartridges. This cylinder is revolved by multipe the stresses. cylinder is revolved by pulling the trigger cylinder is revolved by pulling the trigger the cartridges being successively brought up to a position opposite the barrel reads for firing. The loose joint between the cylinder and the barrel is jumped by the bullet Of course a serious gas leakage occurs at this joint but we have grown setomed to this and never think of it Now suppose we attach a silencer to the muzzle of this revolver The silence to the mustle of this revolver. The shanc or checks the powder gases and holds them. Obviously these gases, imprisoned in the barrel and silencer make their eacape at the joint between the cylinder and the barrel already referred to Iastead of there being a fiash of fire at the muzzle of the barrel there is one at the oint The revolver makes as much noise with the silencer as without it

The writer has had several interesting experiences in demonstrating this matter before legislative bodies. A few States have considered passing laws prohibiting the use of any device for lessening the noise of firearms, and in many cases the writer has been asked to appear at hear ings and show why such laws are not only based upon mistaken ideas, but also why they would be harmful to our many rifle and target shooters Ab these hearings a rific a revolver and a Maxim silencer have been used. The stiencer was adapted so it could be fitted to a revolver or rife. A box of sand made a safe bulletstop. The rifle w uld be fired first with the sliencer to show that the sliencer gould slience The device would then be placed upon the re olver and one half of those upon the re ofter and one mat or most present would be asked to turn their backs and listen to the shots, both with the affecter and without and to say which was which. Those not turning their backs were to see that the experiment was free we's to see that the experiment was free from all question. The service with the distinct would be caustid hirty the sand bur, then reloaded the signeture established and expited again. Then the sentheness with backs turned would be gated withely was which. In no case has it is easily were unanimous. Much gaussement, her always followed. Why they note at Juneau followed that it could be attacked difficult minimis in a sufficient thing in the size of the state of



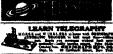
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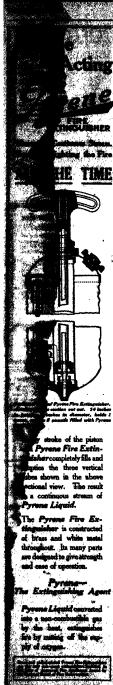


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illegizations tie planel. This weepon is consignated on that where a cartificate is asignated to that where a cartificate is asignate the empty shell, there in the new cartificate and closes the hence again. The recoil performs all these functions. If we attach a glasseer to the mustle of one of these automatic pistols, the powder gases are caught and imprisoned, and when the automatic pistols, the powder gases are segment and the one imprisoned gases are released and blow out backward, sometimes into the face of the shooter. It makes a very dangerous experiment and should never be attempted by those unfantilar with fiverarms.

This is why we have no murders by crooks using silences, except upon the stage. The only weapon with which the silencer really works is the rife. But even in the rife there are several important limitations. These concern the noise made by a bullet in its flight through the air, and is a subject which has been touched upon by the writer in the Scinzwro Assexia, in the past. This article is not quite complete without reference to it. When the rife bullet travels at a velocity less than 1,100 feet per second, its flight is noise, martically speaking. If, however, the velocity exceeds this flight is noise, practically speaking. If, however, the velocity exceeds this flight is noise, can be succeed to the which we have the velocity exceeds this flight is noise cancel of a whiplash to "cruck" is what causes the whiplash to "cruck" is what causes the bullet to "cruck" is what

A builet or a whipiash or any other object morting through the art is like a loat sailing through the art is like a loat sailing through the water. It creates a "bow wave," which trails off to the rear and entwardly. When the velocity of a builet or other object exceeds a certain amount, this bow wave begins to break, except the same as the bow wave from a boat breaks when the boat exceeds its characteristic speed. The breaking of a water wave makes a sphashing sound. The treaking of an air wave makes a cracking sound. We never heard it until we silenced the gun.

assumed the gun.

Another very curious thing is the fact that this "breaking" of the wave seems to occur when the builet acquires the velocity of sound. Any velocity below this appears to be quiet, while any velocity above this makes the noise. The dividing line appears to be a very sharp one.

Thus, even on a rifle, a silencer cannot give absolutely noiseless shooting if ammunition is used which has a bullet ve locity in excess of 1,100 feet per se The silencer will eliminate absolutely the report noise made at the musale of the gun, but it cannot of course control the noise that may be made by the bullet in its flight out beyond the gun. Generally speaking, the only standard rifle ammuni ices than 1,100 feet per second in the 0.22 ing rifle. All larger than this have builet velocities which exceed 1,100 feet per d. Shooting to be noiseless enough for the assassin would then be limited to the 0.22 caliber and also to the use of a ride. This is obviously impractical to s of crime. On the other hand not only the 0.22 caliber, but all the other calibers are immensely increased in value to the target shooter by a silencer. Not only is the 0.22 caliber made quiet enough so that target practice can be held without creating disturbance, but all the larg er calibers can be shot with an entire absence of report concussion and a reduc sizement of report consumming and a reduc-tion of 75 per cent of the receil. As a means of teaching high power rife shoot-ing, the silencer is indispensable. The United States Government adopted it because its value in instructing recruits is

Thus, we see that the fire-iras stencer has limitations. This will spell many consustional stories and noveloping editorials, but it is nevertheless a fight. There is no way in which the crindials can be one with the control of the

A New Gun for Throwing Bombs

tionstate from page 1843 public of the streets lovel a sprayfed on



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ARPER & ROTHERS

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The books are etously and hindemorely bound, harrier in mind possible rough usage. They are printed from a new copper-faced type, and contain about serior backfull interaction and working disparant showeably explaintain the street tion as Harper's Magnation and Harper's Shant, or, Harper's Woodly, and Harper's Baces.

esevation could then be given to the bomb gun, at each shot, by bringing the bubble to the position thus determined. In the improved types now constructed the spring gun is replaced by a system of sights provided with mirrors, which re-fer the lumps of the transfer through flect the image of the target, through a

A Committee of the Comm

reticle to the eye of the gunner.
In attacking a place defended by firein attacking a place defended by after-arms the gunner is protected by a sheet-of chrome steel with hinged and adjust-able end pieces. This shield, which is large enough to shelter several men, is mounted on two wheels and is easily moved, even over rough ground and small obstacles.

The inventor has employed this gun to throw a perforated bomb containing asphyxiating liquids and powders. A detonator, immersed in the mass, is by a wick which is ignited by we. is exploded by a wich in gather to the bustion of the firing charge. In experiments conducted in the presence of the prefect of police and other officials a room more than three hundred feet distant from the gun, was made uninhabitable in a

For fighting fire, the gun is charged with five or six pounds of a dry powder which quickly extinguishes an inciplent conflagration, even if it has already be come too hot to be approached. The ex-tinction is certain in a confined space. It is less certain in the open air, if only one gun is used, but two or more guns fired simultaneously or in rapid succes-sion are reasonably sure to accomplish the desired result. The powder, projected in a closed room, confines the flames within a small space, extinguishes them in its passage and covers the embers with a conting that excludes the air and disengages gases which prevent combustion. The efficacy of the process is due to the simultaneous action of the powder on all simultaneous action of the powder on an parts of the fire. The blast of powder attains a diameter of 10 or 12 feet at a distance of 25 feet from the gun, and covers an area of 200 square feet.

The Mathiot gun is well adapted for throwing life-lines. The barrel of the gun has a longitudinal groove to receive the line attached to the projectile, and the line is in no danger of being cut, frayed or ruptured, as the pressure and the initial velocity are small, although a long range can be obtained with a sufficiently heavy projectile. The construction of the projectile varies according to the special con-ditions of its use. It is usually made of wood, but it may be made of iron, with an in water Some projectiles are of the rocket type and propel themselves by the steady burning of a fuse or by successive

Finally, the Mathlot gun may advan tageously be employed in war for throw ing small bombs of various kinds to a moderate distance with a very satisfactory degree of precision.

#### How Electricity Makes the Dairy Cleaner

(Concluded from page 482.)

ing; but later on electricity was intro-duced for lighting in the cow stables, creamery and horse stables.

In the interior views of the cow stable the electric lamp bulbs may be just dis-tinguished, as they are close up to the ceiling and are set in watertight fix-

Consideration of all conditions that may point the way toward "cleaner" milk is desirable from the fact that our State and municipal authorities have not yet fully realized the gravity of the situation generally. There are, to be sure, several dairy farms such as here described, where milk is produced for commercial use under conditions that are practically perfect. But considerable of the milk still used is But considerable of the milk still used is not prepared in this way, and unless "just teurised" it of necessity is an injurious food, particularly for infants and children—the greatest milk consumers.

It is a well-established belief among those in a position to know, that tuberculesia, typhoid and scarlet favers and diphenoments.



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ings through the drinking of raw milk in which these germs exist. Consequently, the welfare of the future generation depends upon the methods employed to-day in safeguarding our milk supply. The improvement in dairy conditions during the past few years has been marked, and is a result of the greater dissemination of knowledge as to the seriousness of carelessness in the preparation and handling of milk as a food product. During the last year or two there has been a striking decrease in the infant mortality in those places where milk conditions are under careful surveillance. Many lives have been saved and numerous chances of disease avoided by more careful attention to the health of the dairymen, as well as of the cows, and the handling of the milk at the farm, in transportation, and distribution.

The introduction of electricity on the the introduction of electricity on the dairy farm requires a better class of labor. The devices need a little skill in their handling. Such apparatus, however, simplifies labor conditions, and fewer perons, where the work is done by electricity, will accomplish the same or greater work. Improvements of this character must necessarily make for better conditions and are desirable not alone for their commercial gain, but because they are a

benefit to humanity.

It can no longer be doubted that dairy products-and this term includes milk. cream, ice cream, butter and cheese excellent vehicles for the dissemination of pathogenic bacteria. Outbreaks of ty-phoid fever, scarlet fever, diphtheria, sore throat and intestinal disorders of chilthroat and intestinal disorders or can-dren have been definitely traced to con-taminated milk. The proofs of the danger of the With the greatest vigilance on the part of the trained inspectors and the best care on the part of the consumer, this infection cannot be entirely prevented

of course, the carrying out of the recommendations for the production of more sanitary milk, entails additional expense at the farm. But the receipt of a single additional cent per quart of milk would justify many improvements in the average dairy. A single case of sickness from contaminated milk would cost far more than the slight additional price of ter milk for a long period. It is both interesting and important,

lowever, to note that where electric systems are properly planned and correctly installed they invariably result in de-creased cost of operation, if one is careful to include all proper costs when mak-ing the comparison; and this statement holds good no matter whether it be apto the subject of electric power to lighting only. There are some condi-tions under which an exception might be made for other reasons, as for instance, where live steam is near at hand. For sterilizing purposes it might be needed in any event. Such cases, therefore, must be determined on their merits. As a general rule, the use of electricity in the dairy erat fulls, the use of electricity in the dairy will result in economy of operation; and, as an element of modern dairy equip-ment, it suggests the greatest single influment, it suggests the greatest sing ence toward increased cleanliness.

#### Monumental Gateway to a Great

City

(Concluded from page 487.)

sengers, the incoming baggage being un-loaded beyond where the passengers leave the train, and the outgoing baggage being brought up to the baggage cars at the front of the train, from the subways already alluded to. In agreement with the principle of complete segregation of the various classes of passengers, there are two large waiting rooms adjoining the Forty-second Street entrances, one for through long-distance passengers, and another immediately below it for suburban service; each being on the level of the track which it serves. Everything ticket offices, entrances, and exits to the express and suburban service, will be en-tirely distinct and separate, each having



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How U-S-L Storage Battery Converted a the U-S-L Storage

ITTSBURGH is known as one of the hardest communities in the country on electric vehicles. Two or three years ago transportation by this means was regarded as impracticable in this city on account of the hills and general traffic difficulties.

on account of the hills and general trame cumcunters.

The people had to be shown. The US-L Storage Battery did it. By its remarkable power maintenance and austained voltage capacity it present to Pittungth that, with the right hattery, electric transportation is the economical, dependable and clean method for either commercial or pleasure use.

dependable and clean method for either commercial or pleasure uses.

The result was that last syste hundreds of electric vehicles were sold in the Smoby City and 75% of them were equipped with U-S-L Batteries. In apute of the number and attenness of the hills and rough attreets, these batteries are giving 55 to 70 miles on a charge, with far longer life than the ordinary battery gives under such conditions. Users consider that U-S-L Batteries are about 25% more efficient than any other battery on the market.

This Pittsburgh story is one of the greatest reasons in the world why you should yarify that your electric truck or pleasure car be equipped with U-S-L batteries. On all renewals get U-S-L plates. A battery that makes good on balls makes good on the level.

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The waiting room will accommodate about five thousand more; and altogether this great station can take care of nearly thirty thousand people, without subjecting them to uncomfortable crowding. It is estimated that seventy thousand outbound passengers can pass through the terminal in an hour; which is double the maximum carrying power of senger station existing to-day. of any pas

#### Great Train Capacity.

The great train capacity of the sta-tion, estimated at a maximum of two hundred trains an hour, is due to the in-troduction of the loop system, both for express and suburban service. Instead coming in, discharging pass gers and backing out, they will continue, when empty, around a loop under the southerly front of the station; and then will run over to the yard at one side of the station yard, where they will cleaned and made ready for the next trip.

It may be mentioned here that not only has electricity rendered possible this underground and entirely enclosed station, but it has cut out a large amount

#### All-electric Signal System

Mention should be made of the all-elec-tric signal system, the only one of its kind in the United States. The main signal tower is a four-story building, below street level, in which are housed the inter locking machines by which the signal and switches are operated. The machine for the suburban level is the largest ever built; it contains four hundred levers, and on the floor above is a machine with three hundred and sixty-two levers, operating the switches and signals on the expres level. The movement of the trains is indi-cated by little electric lights on a chart which is a fac-simile of the track layout of the yard. The switches and signals are, of course, interlocked. Altogether in the whole yard there are over one thou-sand separate levers. Attention is drawn to the fact that, when the gate to the train platform is closed, its shutting gives an electric signal, not only to the train but to the signal towers clear up the main line-an arrangement which will save minutes of time over the old method

In conclusion, note should be made of the sectional view of the new terminal station, which is shown on page 484 of this issue, and more particularly we direct attention to the lower right hand section of the drawing, in which is shown the remarkable concentration of subway, street surface and elevated lines, which occurs at the new terminal on Forty-sec ond Street. Passengers, on arriving in New York will find themselves in immediate touch with half a dozen distinct lines of transportation by elevated railway, surface car, or subway as the case may be. From the terminal any section of Greater New York may be reached—in most cases without change of cars. At et level, running past the entra the terminals, are the surface cars of several of the main lines of travel north and south through the avenues, and east and west through the streets of the city. Above se is the terminal station of a shor branch of the elevated system, which put the passenger in touch with the east sid system of elevated roads throughout the length of Manhattan and the Bronx. mediately below street level is the fou mediately below street level is the four-track express sulway of the Interborough Company; and below that will be the new sulway of the Hudson and Manhattan Railway by which passengers can proceed direct to the terminals of the western railroads which enter Jersey City. Below that, again, is the Balmont tunnel to Long States. Broad inclined belows and grathat, again, is the semmont numer to home Island. Broad inclined planes and spa-cious footways will enable passengers to proceed direct from their trains to anyone of the three subways, the surface curs, or the elevated trains.

In all probability the Grand Court





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#### Paris Wireless and the Time of Day By the Paris Correspondent of the Scientific American

THE International Time Confe THE International Trecently finished its work at the Paris Observatory, which was chosen for the meetings, and some resolutions of interest were decided. One of the principal decisions is that all the researches made in different observatories all over the world as concerns the determining, preserving and transmission of time, are to be hence forth centralized at Paris A competitor for such a horary center was the power-ful German wireless telegraph station of Norddeich which, like the Eiffel Tower, engaged in sending out regular time signals each night, but the German delegation finally entered into the present agreement. The choice of Paris as a center point is due among others to the use of the Eiffel Tower for wireless signaling as being the highest in the world, and also to the established reputation of the observatory, one of whose eminent members M Ch Nordmann, supplied me with the present information

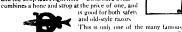
Besides the tower, whose signals carry for nearly 4,000 miles at present, but which is not sufficient for more distant points, there are chosen a certain number of other stations encircling the globe, and of other stations encircing the globe, and all these will be regulated according to the tower plant. Each station in turn will serve as a center for sending out time signals over a given radius, these to be sent at different hours of the day so as not to interfere with each other. When all the stations are working it is not too much to say that all points on the earth's surface will receive time signals twice a day at least, for the use of navigators, ex-plorers, surveyors, railroads, scientific stations, clockmakers and the like, giving the exact time within one tenth of a second It was decided that the time in all cases is to be based on the Greenwich meridian as a standard, to which it is easy to bring the local time at any spot by astronomical observations In this way navigators are able to find their bear lings no matter what station may be sending the time signals, by referring to the chart. The stations which are chosen by the conference to act as time signal sta tions are as follows, and accompanying each is the figure for Greenwich time which each one will send out there is used the new 24-hour time notathere is used the new 24-noir time normalities, starting from midnight as usual, but counting 24 hours for the entire day up to the following midnight. Thus 3 o'clock P. M. is now 15, hours, etc. Stations. Paris, midnight and 10 hours; San Fernando, Brazil, 2 and 16 hours Arlington, U. S. A., 3 and 17 hours; Mogadisclo (Somall region) and Manila, 4 hours, Timbuctoo, 6 hours; Norddeich, Germany (the great wireless station), noon and 22 hours; Massaouh (Erythrea), 18 hours; San Francisco, 20 hours. However it should be stated that these decisions are of a scientific but not a governmental order, and it is now required that each of the respective governments enter into the No doubt this will follow, as it w recognized that the wireless time signals will have a great practical value.

The Tenth International Congress of Agriculture will be held at Ghent, Belgium, June 8th to 13th, 1913. The general secretary is M. Paul de Vuyst, direc-tor-general of the Rural Office in Brus-sels.

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1.008E LEAF BINDER — J. T. BRIWE, Station C. 414 Breadway Ave. Toprka, and H.
Nomerson, Toprka, Xan. The purpose of
the invention is to provide a new and improved
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to be of substantially unlimited capacity, and
capable of quick and easy opening and closing
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transom proper by means of a spring, which
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the door easier, and the rot is operated, that
the door easier, and the rot is operated, that
the door that the same posttion, by improved that.

NAY LIVES.

tion, by improved means.

INVALIDES BODY SUPPORT—R. 8.

WANKE, P. O. Ros. 8. Arapahoe, N. C. An object here is to provide, a device by means of which a portion, such as a paralytic, who is MONGER "—in 175 page, and well be enabled to support his body and even to wait. Further to provide a device by means of which a log which has been paralytical or district the provide as device by means of which a log which has been paralytical or district when the provided in the paralytic of the provided as a constant of the walling of the walling of the walling of the provided as a constant of the walling of the

body max be moved so as to add in walking CHIARR—H. It KAANS, care of Grand Control Hotel Nelson, Riondel, British Columbia, Connada This invention provides an apparatus wherein provides in smale for the exclusion of extraneous matter, such as grit, dust or water; provides means for insuring the supply of oil the apparatus, to insure the steady delivery of oil during the use of the oiler; and to provide means for locking the device in seaded position, to prevent the delivery of oil there from

#### Heating and Lighting.

Heating and Lighting.

(AB BirkNit: w N Beer, Eq. 11 Broad,
way, New York, N Y The special aim of
this inventor is to so construct the burner
that the combustible gas after recaping will
become mixed with air and hurn closely adjacent the surface of the refractory material,
which hast will retain the heat and facilitate
the combustion.

which last will retain the heat and facilitative combastion.

METHOLOW J WARRACH, JON 723 Morgania NEEN & J WARRACH, JON 723 Morgania of the second section of the second section of the second section of the chimory are relative thickness of giasa at the top, but in which the top- and body of the chimory are of uniform thickness, that the second section of the chimory are of uniform thickness, the control of the second section of the section of the second section of the section of the second section of the section of

came

GAR GENERATOR —R. C. Branter, 287 De

Strd St., Shreeport, La. An object here is
to provide a light, compact, and easily transportable dwine represently designed for use
this prepared curtifully and having means
for moving the cartridge into or out of the
water, and for sealing the cartridge in a holder
when not in action.

#### Household Utilities

Mousehold Tullities.

WARHIDA/ID—Marria A. Mozar, 230
Kanp Rt, Brooklys, N. Y. The object here is to provide an improved means for retained in the control of the control o



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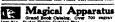
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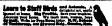
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earn Watchmaking







#### Machines and Mechanical Devices.

Mackines and Mechanical Devices.
POWER TRANSMITTING DEVICES—J. W.
RYORER, 812 F. Harrison M., Marion, Ind. An object in this same is to provide a device or increasing power, which is made of few parts and is not liable to get out of order A further purpose is to provide a device arranged so that by a slight change the ratio of the increase of power may be varied.

increase of power may be varied InAVIT o B Kvotri, care of Hans Rugge, 407 Sameet Bidg, Reillingham, Wash This dawti may be quickly operated to extend out ward a track on which the supporting carriage may travel, the means for extending netward the track, and for supporting the carriage on the track after it is extended, being operable by a slugic member under the control of one man

GRAIN ELEVATOR.---R. L. MAPSON, La Mesa GRAIN ELECTROIL—R. I. MAPONO, LA Meon. Cal. This invention provides a conveyor and elevator adapted to be disposed at a plurufity of angles relatively to one another, by means of which grain may be conveved from a plural ty of positions to be fed into a threshing machine which remains stationary, there being means connected with the threshing machine adapted for driving the elevator and conveyer.

adapted for driving the elevator and conveyer APPARATY SPOIL RISTING ORI BELLIVER ING TICKETS AND OTHER ARTICLES—4.1 I. F. SOLLAR, 44 Hue Channy, Drafs, France, In this invention the artuntion of the devices in withdrawing the ticket or other article at the same time actuatos an apparatus which adols the price of the tiket which are not all adols the price of the tiket which are not in-able to the contract of the contract of the The Apparatus therefore, comprise, as the respective of the tiket is based. MOLID—W. J. BRU, SE., are of H. Andrew MOLID—W. J. BRU, SE., are of H. Andrew

long the value of the theets issued MOLI--W J Bort, Ng., are of H Ander son, McLennsbers, III. This modd has a frame with two sprocket which, one Journaled a cool and, with agrobel clothes disposed around cool and, with agrobel clothes disposed around cooling the special cooling of the sprocket wheels is rotated the filterium armbors will be moved relatively to the frame, and the arms which are plyoidly connected with the full run more bers, and with the modeled members will be moved by the special control of the special c

moved to push the last into position
While OR FILM FERDING MECHANISM—
J. Using, care of L. G. Erb, 1002 Ciny Vie,
New York, N. Y. This inscent provides a
mechanism, which permits proper feeding of
the web or film and at the same time allows
an accurate taking or projecting of pitures
without jels to, jut of the film or web, thus
woulding the usual filter of the pitture projected on the acreem.

#### Prime Movers and Their Acces

AUTOMATIC STEAM FREED AND DISTON RID BUTPULT — W VAN DER LEIST, NSBOL WIS The older of this his value is to pro-vide a strain feed and platen red support for use in the steam feed withder for supporting the strain of the particle of the properties that were on the parking and loss of power

quent wear on the pactings and loss of power PRESSURE GUENE J. HILVERY SEPT. Pa. This invention relates generally to pres-sure gages and more particularly to an adjus-able means of connection between the expan-sible element and the intermediate actuating devices for the pointer. The construction and arrangement of the parts are such that adjus-ments may be made without dismantiling the care.

EAST.

CARBURETER.-L. Samus. 2005 Delvare.

St. Indianapolis, Ind. The objects of this investion are to more thorought valuable. The special process of the investion are to make thorough the spray as near as practicable centrally in relation to the atomatine channels through which it is forced to the engine through which it is forced to the cupine through which it is forced to the cupine through which it is forced to the cupine through the carbureter in counciling gases; to adopt the carbureter in counciling states of the controlling the needle value in atomiting, and to provide an adjustable floor.

PRESNUE 64.018: J. Outlant, 30 Highlight 1978.

PRESSURE GAGE - J ORILL, 39 Highfield PRESSURE GAUE. J ORILL, 39 Highfield Grove, Rock Ferr. Cheshire, England This invention relates to pressure gages, and has for its purpose to construct a simple and con-venient gage for measurement of the maximum pressure attained in fluctuating or putertise pressure action is produced in the cylinders of internal condustion engines.

NOTE — Copies of any of these patents will be furnished by the NCIENTIPIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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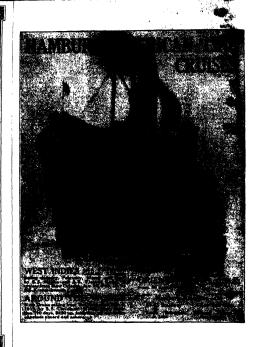


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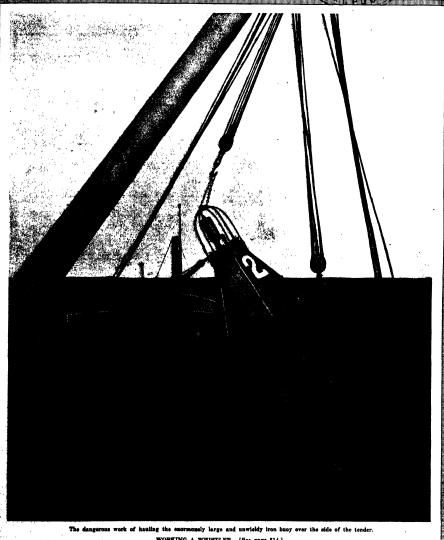
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# THE WEEKLY JOURNAL OF PRACTICAL INFO

Man Cyn. ]

NEW YORK, DECEMBER 14, 1912



WORKING A WHISTLER.-[See page 514.]

# SCIENTIFIC AMERICAN

NEW YORK, SATURDAY, DECEMBER 14, 1912
Published by Munn & Co., Incorporated. Charles Allen Munn, President Froderick Converse Beach, Recretary and Tressurer and 1818 of Broad ear, New York

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are search, the articles shown, and the facts authorist the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### Solving the Pier Problem

Tillic recent action of the Board of Estimate of this city, in the matter of pier extension, advances the question a long way toward a saffactor's solution. The Board approved the plans for constructing piers of 1,000 to 1,200 rest length, between Poity-fourth and Fifty-slath streets, by making his necessary occavation insiders, it also approved the plan for straightfulling the pierhead fine between the Battery and Thirtieth Street; a relocation which would permit the construction between those points of a score of piers from 250 to 1,040 feet in length. These improvements are those suggested by the Terminal Committee of the Board of Estimate and by a State board appointed by Governor Dr. A copy of the report and the resolution of the Board of Estimate laws been forwarded to Mr. Stimen, the Secretary of War, with whom the determination of pichead lines finally reds.

The two plans are complementary, and both are, or will prove to be, necessary to meet the demands of future shipping. The extension and straightening of the pierhead line will give immediate relief, and make it possible to build ships of 190 to 1,000 feet length, without anxiety us to the question of dock accommodation

Nobody can place any exact limit upon the size of future stemphiles - provided, always provided, that the deepening of entrance channels keeps pace with the deepening of entrance channels keeps pace with the ship's ever-deepening draft. It is now fairly certainty that the year 1933 will see the larging down of the keel of the first 1,008-foot ship; and the economic conditions which justify the 1,009-foot ship can compare the shipping people to indit one 1,100, 1,200 or even 1,500 of carrying the individual passenger or a given amount of freight. But when the Secretary of War has subscribed to the secretary of the size of t

Hence the great importance of the Board of Estimate's plan for obtaining possession of the present rather unimportant stretch of plevs between Forty-fourth and Pitry skth streets, together with sufficient land for the construction of 1,600-foot or even longer plers by exercising back into Manhattan. For it may be taken for granted that the giant ships of the future will note for decking facilities, not at Boatson, New London, or Manhattan; and the city will have failed to bear the lesson of the present impose of it to milks to make provided for a growth in the size of ships which is certain to take place.

Hence, we suggest that while the city is making the necessary purchases of land in the uptown district, it acquire the whole depth of the blocks between Forty-fourth and Fifty-slath streets, from Twelfth to Eleventh avenues. This would give accommodation for piters 1,500 feet deep, and for the terminal buildings and marginal elevated road, proposed by 1rock Commostoner Tomkins.

The piers would be built in numbers and length,

The plers would be built in numbers and length, only as needed, and it might be two decades or more before the 1,500-foot ship appeared; but he would be a bold prophet who, turning from the 100 per clut increase of length of the past quarter of a century when the property of the past quarter of a century to come.

#### An Admirable Civic Body

In fulfilling its avowed purpose of recording the world's progress in scientific knowledge and industrial scholerosensi, the Sunraturo Austroan has always given much attention to important engineering works of a municipal character. In the course of our investigations, we have noticed how frequently—we had almost said invariably—our study of large number just problems has brought to soomer or later, and generally soomer than later, into touch with that admirable body, the Merchants' Association of New York

Which means, of course, that this body of highminded citisens for many years park has been doing well its work of safesparding and promoting the litercents of the commercial capital of the western hemisphers. The Association has been both watchdag and worker. It has slwars been the terror of the spoilsman, whether he was represented by a powerful political law-juggling citique at Alianup, by the dishonest contractor for city works of great magnitude, or by the innumerable petty larceay graffers which follow in the train of the generals and captains in the work of municipal spoilation.

The Merchante' Association has rendered its many services to the city so quistly, that we believe the average citizen has no adequate conception of the average citizen has no adequate conception of the average citizen so have been added to the control of the average citizen so fower york. In every hig civic question which has arisen, or at least in those of a scientific, technical or constructive character, such as come within the profine of this journal, the attitude of the Merchant's Association has invariably, if our memory serves us right, been the one which seemed to this journal to be for the best interests of the city.

The record of work accomplished by the Association is a long one, and its successes have been notable. There comes to our mind the winning fight, which was so althy waged by this body against that attempted colosal friud of the Ramapo watershed. But for the work of the Association, a band of rapactous politicals would have committed this city to a system of water supply, the sources of which would have been held for ransom by the members of the land themselves. The scheme was exposed and fraitested, and out of this gattation has ultimately come the construction of the magnificent Cutskill waters supply, which is son to be at the city's disposel.

Another successful agitation was that which secured, in the face of political and interested opposition, the passage of the l'emerylvania tunnel franchise, which to-day is yielding a considerable annual revenue to the eity. To the Association is due, in no small degree, the Federal uppropriation of six million dollars the diredgin, of the 44-foot channel into New York barlor, which is now practically completed. But for this channel, the modern lines of vast ionght and draft which now enter this harbor must have sought some other port of call.

Not nlove was the Association the original moving power which led to the enlargement of the Eric Cauai; but it was largely instrumental in securing the canal terminuls, which are necessary if the city is to reap the benefit of that great work. Moreover, the Association had much to do with the pussage of the legislation providing for the elevated freight tracks along the Hudson Hiver waterfrant, associated with guitable spraints, at which all railroads could deliver their freight.

In this connection, mention should be made of the protective influence of the Associtation, as shown in their successful efforts to induce the redernal government and the State of New York to join in a suit to prevent the State of New Jersey from discharging the swage of the Passale Valley into New York harbor. The Merchante' Association resilesse that the approaching construction of the Panama and Eric canals,

The Merchanta' Association resities: that the approaching construction of the Pannam and Eric canals, and the unparalleled growth of the city in population, wealth and trade, to say nothing of the active rivalry of other seaports, calls for a proportionate increase of activity in so meeting the new conditions as to promet the best interests of the city. The Association wheles to broaden the field of its operations, and it is looking for the more active support of the prominent and industrial citizens of New York. One of the encouraging signs of the time is the increasing recognition of the demands of citizenship upon the voluntary services of the individual citizen. Within the ranks of the Merchanta' Association he will find-both the organization and the means for giving practical expression to his desire for the political and commercial improvement of the fity.

#### Selling Patented Articles

HE recent decision of the United States Supreme Court in the Dick Mineograph Patent Case, and the widely quoted dissecting opinion of Casien Justice White from this decision is the chief consistent for the present passion to change the patent system. Almost greeybody who read Oxiss, Testice Width seating opinion was imbreed both the idea that creates, Hearty, who made the fall the idea thought, was held as a patent infringer, because Skon, the gift who owned the missocrapph which missued; longitt some of Henry's int and used it. We not not return's ever knowing anything about it.

out poor Henry's ever knowing snything about it.

The Iruth is that Itok's misseeraph was sold upon condition that it be used exclusively with Di ye luk. Henry, knowing all about this license resulting, and with the expectation and insertices this ink would be used for the purpose of critical states and this restriction—to which Miss Skon, as Resulting knew, and expressly assented obeside the restriction—to which Miss Skon, as Resulting knew, and expressly assented obeside the second sec

It is a peculiarity of patented articles, as many manutherturers and inventors explained to a congressional committee as soon as they had the chance, that they are essentially new and unfamiliar. The patent owners can control them only during the seventeen pears that the patent codures. All the resources of past experience in advanced salesmanship are noue too adequate to market a new and unfamiliar patented articles, the use of which may mean a decided change in the personal labits of a large portion of the public.

In the rather colloquially expressed opinion of one authority, who testified before the congressional committee in question:

mittee in question:

"The more invention of merchandise is almost a minor consideration when put up against the selling and marketing of merchandise. There are thousands of inventions in this country which are very valuable indeed, but which on several building because of the selling problems involved. There are big and serious selling problems involved in merchandise, especially patentied merchandise. If you are selling shoots, there have been problems involved and the problems involved to merchandise, especially patentied merchandise. If you are selling shoots, there have been you take a patented article, think what factors, but when you take a patented article, think what the problems in the problems. The problems in the

else, and you have got to overcome that resistance."
If the patented article depends for its successful
operation upon the use of supplies especially adapted
to it, the difficulties are immensely bicrossed. "It may
be," explained a member of the Inventor's Guild, "that
he article is of such nature that in order that it shall
work properly. It shall require very great care in
selecting certain conditions of use, certain materials
to be used in counsection with it. It certainly is a fact,
that, in some hustances, a man with a market for a
good article would be completely destroyed, if the could
not insure himself in seeing that it was properly used
after it left his hands."

Mr. H. Ward Leonard, a former associate of Mr. Edison's and now a famous electrical inventor on his own account, was asked, when he appeared, whether the self-interest of the customer was a not sufficient substitute for any liceuse restriction. He replied:

uces nor any Recuse restriction. He replied:

"I cannot agree that that would be sufficient protertion to the manufacturer whose sale depends entirely
to the manufacturer whose sale depends entirely
have been a meaufacturer long enough to know that there
is nothing which so instarce your furture business of a priofit
as universality high quality, and it only takes a few cases
that are agreed abroad by your compettors as to the improper working of an article to have a very serious effect upon
your business."

The chief obstacle in the marketing of an uniried patentied article is always the initial expense of its uprechase price. The price, in any sum that fairly compensates the patent owner, is, in many cases, too high to sail the article. To avoid this obstacle, and so far as possible to relieve this additional expense, various plang-where been devised, under which the customer pays for the use of the patented article, only after he has actually used it, and then only in strict proportion to the amount of benefit which he derives. Said one witnesse:

Witness: "Suppose a machine is invested for which a manufacturer cannot afford to pay an adequate price outright. Dut fiverbot lets him use it; and agrees that he shall pay the inference of the state of the state

Under this plan, the customer obtains physical possession of the patested article, together with the right to use it under the cognitions of the liouse, but is not obliged to pay the patent owner anything for the right, of use, volces he actually exercises it; and it he uses, the patented article at all, he compensates the patent owner strictly in state proportion by the efficiency of the patents article and set proportion is the settlement. Bill Market States Charles Control

The parties of the pa

the Lord Here: The Sensie Investigation here and the Lord Mercey Court in England did their work well, and their resonances delices, if followed and embodied in shelf their resolutions distinct, if followed and embodied in plantative asts, will render the recurrence of such a dis-since on happened to the "Triestle" impossible. Much depends upon the work of the International Congress, which is space is mast in London. When its recommenda-tions have hear, made public, they should be embodied in the happy of all maridian nations, before the lapse of time has predicated, the elimitus of the disease.

Size-Scaling Activity in Great Scitch.—The British and Scials ship-building yards are enjoying an unwonted us of prespectry. At present there are 562 vessels, spreading 2,866,871 tons, under construction, which aggregating 3,000,071 tous, unour communication, mains suppressing an inspection of 25 per cent over the tonnage of vessels being holds last year. The shipyards cannot object, sufficient mea, and they are frequently working over-time and using double shifts. In spite of this activ-\*\*\*Towasse near using counts sures. In spite of this soties it ity, inex coldens are being taken faster; than the ship set being completed. Though American operations are on a number smaller spale, it is gradifying to know that our parks are also full of work.

Panama Canal Rates Fixed.—President Taft has fixed a value for the Panama Canal as follows: Merchant the valve for the Panama Canal as follows: Merchant vasued, entrying passengers or earro, 81.20 per net vossel tot. Vessels in ballast without passengers or carpo, 40 per cent less than the rate of toll for vessels with passengers or carpo, 40 per cent less than the rate of toll for vessels with passengers or carpo, 50 per carpo, 50 per cent less than the rate of the considers, hought adopt and supply altips the rate will be 60 cents per displacement von. American construies shipping is enempted from payment of tolls. It should be noted that the rates named in the President's proclamation are presidently the same as those which will be unforced at the Sucs Canal next year.

British 13.5-tach Gus Bursty.—The recent bursting of a British naval 13.6-inch gun at Shoeburyness will at once king to mind the controvery which formerly raped ever the question of the relative strength of wire-wound as against hooped guns, for we presume that the 13.5-tack place was one of the new naval weapons which are carried by the latest British dreadnoughts of the 'Orton'. mass. The advocated or wave-want consecution usami, or did claim before the recent improvements in hooped guns, that the wire-wound gun, because of the absolute impection to which every part of it could be subjected, was proof against the kind of accident which recently sed at the proving ground.

happened at the proving ground.

Compression for Swand Ingeta.—Benjamin Talbot, of Middiesborough, England, is securing good results with his system of fluid compression for producing sound ingots. During pouring, two ounces of aluminium per ton is added to the fluid steal. The ingot is seaked to give a sideless cavelope and secure the desired temperature for compression, which is obtained by reducing it in the blooming mill. 20 by 38-hot ingot being reduced to 18 by 18 inches. After further treatment in the scaking pit, it is relied into a blosm which is ready for the mills. Easis solid from these blooms are characterized by a hard working hos, with a harder section behind it, and a somewhat softer coater. newhat softer center.

Weeld's Langest Arch Bridge Being Bulli.—Work on the foundations of what, when completed, will be by far the greatest arch bridge in existence, is being actively prosecuted at Hell Gata, in the East River. The bridge, prosecuted at Hell Gate, in the East River. The bridge, which has hene designed by Gustav Lindentials, will con-tain a four-treats, sicel, arch span of one thousand feet. It will be espable of carrying, with a wide margin of safety, four of the heaviest of our modern breight testas abreaus at the same time. Including its approaches, the singuistic wifer some three miles in length. It will spira is comment tile New Haven and Pennylvania ya-tessa by way of Long Island, the Punnylvania East River spussel and the Punnylvania East River spussel and the Punnylvania freight ferry across this minuse her.

the tipper bay.

Sallments and the Shiel Trada.—Recent published intribilities show what a visit amount of steel is demanded in the sallment of the sallment o

The Transpa-Brahmsputra Question was left unset ted by the recent British expedition against the Abors sithough a sertain amount of geographical work was don in that connection. Now it is announced that another tion was left unset-a against the Abors, sithough a sertain amount of geographical work was done in that connection. Now it is announced that another attenue; will be made this winter to penetrate the unex-plored region of the Upper Dihong, i. e., the portion of the great river of Thet and Assam that is still a dotted line or, R.E., who will be accompanied by a detachmen of military police.

The Bryant Expedition to Labrador.—Mr. H. C. Expant, prediction of the Geographical Society of Philadelphia, recently spent three months in an exploration of the St. Augustine River, which enters the Gulf of St. Lawrence in Canadian Labrador. The river was ascended to its source, 141 miles, partly through country never before visited by white men. Only the desertion of the Indian guidee, and an accident to one of the party, prevented Mr. Byant from continuing his journey northward to Hamilton Inlet. Valuable entomological, general contents and white properties are sured. The Bryant Expedition to Labrador.-Mr. H. C. d, and photographic collections were secured.

The Livingstone Centenary.—The centenary of the The Livingsteen Contenery.—The centenery of the birth of David Livingstone will be celebrated next March by the geographers of the world. The Royal Geographic all Society, in London, will hold a special meeting on March 17th, when Sir Harry Johnston, the great African explores and administrator, will delive an address, and it is expected that Sir John Kirk, the only surviving comwas expected that Sir John Kirk, the only surviv panion of Livingstone on his expedition of 1858 be present. The same society will panno of Livingstone on an experiment or 100-05, with be present. The same society will hold an exhibition of Livingstone relies. Later in the month Livingstone will be commemorated in his native Scotland by a special meeting of the Royal Scottich Geographical Society, also to be addressed by Sir Harry Johnston.

An Agricultural Department in China.—The Republic of China has established a Department of Agriculture and Forestry on modern lines, and this institution has begun publishing an agricultural journal (all in Chinesa) which publishing an agricultural journal (all in Chinese), which appears three times a month. It is understood that a national meteorological service will be established branch of this department, and that it will be und direction of Dr. Hing Kwai Fung, who was educated at Cornell University, and who for a year past has been attached to the Bureau of Plant Industry in Washington as an agricultural expert. Dr. Fung has started for China by way of Europe, where he will make a round of visits to meteorological observatorice.

visits to meteorological observatories.

Dev Ponda.—Mr. Edynad (Agarin, who has now spent some years in investigating the mysterious dev-ponds of the English downs (see Scinttgrit, American, August 6th, 1910, p. 100), made as progress sport on this subject at the last meeting of the British Amgeisation. He stated that he "sees in fogs and milat the factor which tends to keep alive the best-made of the ponds. The precipitation of mist into the ponds, sided perhaps by silent discharges of electricity, and the entanglement of mist-ladon salturat in the hollows in which the ponds le, are believed to be the means by which some ponds maintain a supply of water all through the very in solic of the great draught. water all through the year, in spite of the great draught made upon them by numerous cattle."

A Signaling Anemometer.—The West and South Clare Light Railway, in western Ireland, has occasionally had its trains decalled by high winds from the Atlantic Ocean. In order to obtain timely notice of the occurrence of such In order to Joran meny notice of the oversity of the winds the company has borrowed from the British Meteorological Office a pressure tube anemometer, which is installed at Quity station in charge of the stationmaster. This anemometer is fitted with an electrical attachment, derised in the Meteorological Office, which gives a signal when the wind reaches a certain strength. gives a signal when the wind reaches a certain strength. The first signal is given for a wind velocity of 55 miles an abour; under such ponditions ballast is placed on the trains to insprease their stability. If the wind rises to 85 miles an hour a second signal is given, and traffic is then sus-

an hour a second signed is given, and craims is then unpengled.

The Vaplability of Solar Radiation appears to have a
range of from 5 to 10 per cent, with an irregular period of
from 5 to 10 days. That these fluctuations as measured
within the extra a kimosphere represent exiting plannes
in the solar outstout, and are not merely the result of local
conditions, of observation, can, be determined only by
simulpassons observations at the fluctuation of the solar policity of the control of the solar policity of the control of the control of the control
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to a distinguish optical conditions in Agents, where
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#### Aeronautica

An Aerial Maxim at Aldershot.—Among the practical an aerial maxim at Alcerasic—Among the presumes work being carried out by the Royal Plying Corps at Aldershot is an extensive series of experiments with a Maxim gun fitted to a hiplane of the B.E. type. Canva largets representing seroplanes have been placed on targets representing seroplanes have been placed on terra firma and tests made by firing at them from heights up to 3,000 f

Operating a Parachute by Compressed Alr.—In pat-ent No. 1,043,836, William A. Hodge presents in con-nection with a parachute, and a compressed-air reservoir adapted to be secured to the acronaut, a valve controlled nozzle for the reservoir which is arranged to discharge to the parachute, means being provided for releasing parachute and for opening the nozzle vsive so that the compressed air can open the parachute.

urning of the Military Aviation Establishment at Sebastopol.—A disastrous fire occurred not long since which resulted in the destruction of a large amount of aeronautic material at the military aviation establishment at Sebastopol. Russia. The fire appears we mare been caused by an explosion of gasoline, and this set fire to the machine shops in the first place, then the fire spread to the rest of the buildings on the grounds and three hangars were thus consumed, along with four seroment at Sebastopol. Russia. The fire appears to have planes, three automobiles and the storehouse for pieces. The loss is estimated at about \$100,000

From Paris to Rouen and Return.—Hydro-aeroplane will ply upon the Seine from Paris to Rouen and back win py upon the scene from rars to rouse and users, according to the events which are now being organized in seronautic circles in the city, and prizes to the amount of \$4,000 are to be offered on this occasion. It was ex-pected to hold the contest about the middle of October, but it will be postponed for a greater or less time on acnavigation and the like which it will take some time to settle. The event is to be an international one and is likely to bring out some brilliant performances, as Deper-dussin, Borel, Rep and Nicuport hydro-aeroplanes are already engaged.

Experiments in Automatic Control by Gyroscopic Means.—Some interesting experiments have been made in automatically stabilizing an aeroplane in both the transverse and fore and aft direction by means of gyro-Numerous test flights with a Curtiss biplane re made over water in a hilly country under exceed-dy puffy wind conditions. The automatic control ingly puffy wind conditions. e, which is regulated by means of a small gyroscope, it is said, held the machine on an even keel under the most adverse conditions. This device, which is the in-vention of a well-known electrical engineer, is intended vention of a wear-more recorders engineer, is incurred to produce the proper degree of banking at all times when the aeroplane describes a curve, and if its speed falls below 36 miles an hour, it is designed to cause the machine automatically to volplane. Two small gyroscopes, one for the transverse and one for the longitudinal stabilone for the transverse and one for the longitudinal stani-ity, are employed, and the extremely small amount of power to run them is obtained from a dynamo which can also be used to send wireless messages. The whole apparatus, including the dynamo, does not weigh more than about thirty pounds. We expect to publish a com-plete description of this device in the near future.

Results Obtained by the Bulgarian Aeropiane Corps in the War with Turkey.—Word has just been received from a well-known war correspondent giving the results obtained by the Bulgarian and professional aviators who obtained by the Bulgarian and provessional variators wan took part in the war which is now about at an end. Thirty aeroplanes of different types were used, and both the officer aviators and the professional airmen made many flights accompanied by military observers. These flights were never made at a lower altitude than 1,000 feet and usually at between 1,200 and 1,500, which this correspondent claims is out of reach of rifle fire. We learn from another source, however, that an aeroplane was hit by bullets when at a height of 4,000 feet, but the was not by unness when are a length of a charlest, which have bullets did not in any case do serious damage. We have already reported the death of the Russian Poppoff, which it is now claimed was due to the machine having caught in the air. The aviator and his companion were killed by the fall sustained as the result of this accident. It is extremely doubtful whether Turkish bombs set the aero-plane on fire as originally claimed. A Bulgarian aviator was also killed and another captured. The cit Adrianople was set on fire by bombs dropped from The city of garian aeroplanes, but the latter were unable to hit bat-teries or small bodies of troops without flying too low for As for reconnectering, the results were not as safety. As for reconnotisting, the results were not as sensational as in some of the European maneuvers, though nevertheless very important. A trained military observer found it easy, after a number of flights, to locate battery positions, infantry trenches, or any considerable ber of soldiers when in the open country, but not they were under cover of trees or in the strents of a When the information was not obtained on a first flight, a repetition of this flight generally brought it. No planes were used by the army which fought its way to Tehatalja.

#### An Automatic Gasoline Engine Cream Separator

By Frank C. Perkins

THE accompanying illustration shows a novel gasoline motor-driven automatic cream separator which is a most efficient farm labor saving device. This ma chine is a combination gasoline engine and cream separator built into one the power being supplied by a four cycle 1/2 horse-power gasoline engine which in 15 sconds has the bowl running at full speed No cranking of the engine is necessary as a short

piece of tope is attached to the starting pulley and pulled over as in spinning a top

This separator has a capacity of over 700 pounds or hour and will skim faster than ten men can milk, and when the milking is done the skimming is done The engine is also equipped with a flat pulley to be used in operating a washing machine churn or any er hand power machine to which a gasoline engir applicable. The belt can be disconnected from the erator howl in an instant and the result is an inde endent gasoline engine of 1/2 horse power

#### An Apparatus for Making Observations From Aeroplanes

By the Paris Correspondent of the Scientific American

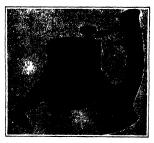
A FRENCH engineer M Duchene has invented an Apparatus for making observations from aeroplanes is likely to prove very useful especially for which is likely to prove very useful especially for military work. The following description of the apparatus was presented at a recent meeting of the Acad ende des Sciences at Paris. When engaged in souting or other work it may at certain times be necessary for the observer to examine the ground over which he is fiving and compare it with a map and this may have to be done for a considerable time during the flight Again he may need to identify the ground after having lost sight of it owing to a fog or at other times to note the exact position of a point on the ground a camp or body of troops for instance with reference to some prominent landmark. But the main difficulty which aviators find in observations of this kind lies in the speed of the flight, and as this is likely to become much higher as time goes on the drawbacks will also much nigher as time goes on the drawbacks will also increase Theoretically the aeroplane should stop on its flight so as to be able to obtain a perfect observa-tion. One way to secure this is by making the aero-plane take circular flights around the ground to be observed but this also presents the difficulty that the ground appears to the eve to turn about in the oppo-site sense to the flight. This effect is known to pilots to be very bad and aeronauts who mount in spherical balloons see the difficulty that is found in observing the ground and comparing it with a map when the basket is making even a slight rotation M Duchene s apparatus is designed to keep the image of the ground in a fixed position with reference to the observers eye
by using a set of two mirrors which are rotated oppo sitely to the aeroplane flight. In this way the gr sitely to the acropsance algal. In this way the savenas always shows the same aspect to the eye and the observer can compare it with a map without any trouble from the motion as before. The apparatus con sists essentially of a pair of plane mirrors A and B contained within a conical protecting cover F provided with a handle U. The whole is properly fixed to the roplane so that the image of the ground is re seropiane so cust cus image or the grouns is received in the mirror B This mirror is always inclined at a fixed angle of 45 degrees and is held on an arm so that it can rotate abut the central part and follow around in the inside of the cunical cover After once adjusting the mirror is solid with the arm and has no other move ment than that f a retation about the central axis so that it is always inclined at the 45 degree angle Mounted at the center is a smaller and vertical mirror A which can totate about the central pivot but always keeps the vertical position. It is evident that the finage of the ground when received by the mirror B will be thener reflected independently into the mirrot A and this reflects it herizontally into the observer a eye. Should an object (or the ground) underneath B be made to change in position such object will no longer would need to change his position so as to continue to see the same object. What is now done is to keep to see the same object. What is now done is to keep the eye fixed as is necessary in an accoplane and to rotate the mirror set by hand so that the pilot keeps the same image always in his line of sight while the ground is moving with reference to the accoplane. This is readily carried out by connecting the two mirrors by gearing in a way so that when B is made to rotate around its path 4 also rotates at just the proper angle to keep the image always in the same line that is in the observers eye. The movement of A thus centinually compensates for the movement of R Stated rately if the mirror B is constantly operated by the hand so as to keep a fixed position in space-(or with reference to the ground) while the acroplane is inducement the image reflected from B takes the



Automatic gasoline engine cream separator.

ponding rotation which is equal to that of the aeroplane. To compensate for this and to keep the image always in the same line, the mirror A must rotate at an angle equal to half the angle through which B turns in one sense and the aeroplane in This is the principle of the sextant

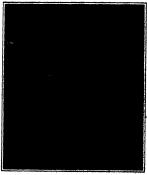
All that is needed is to use a 2 to 1 gear ratio for the mirrors so that they rotate at the proper relative



Duchene apparatus for making observations from aeropianes.

A small mirror silvered both sides B large mirror
or arm supporting large mirror D gearing which by action
of winding mechanism turns large mirror twice as fast
as the small one B turning mechanism P protecting
cover O handle B counterweight for large mirror

ed to meet these con ditions, the large mirror turn ing at twice the rate of the small one, and the image of the ground is always sent into the observer's eye. He must operate the milled nut at the top so as to



A machine for counting bills,

keep up the refetton of the interior of the interior of the same fined. It is not so that it appears their in the same of the same in the same in the same from the same from the other extrace of a time image from the other extrace of a time. so that A must be silvered on both so must a other of surveyer, on some weeks. This point, however, can be presented ower regular by a operating the milled head. The investor constitute the present design need not be a definite one, illustry to be improved. It is sufficient, however show the principle of the apparatus.

#### A Mechanical Bill Counter for the United States Treasury By C. H. Claudy

MONEY counting is an art. Any one can count a small sum of money slowly To count a large sum of money quickly requires not only avescular skill of a high order, but strict attention. It is wearlsome, nerve-racking. The monotony of it makes the human

nerve-noting. The monotony of it makes the Musua, counter liable to error

50 a mechanical automatic money counter is a machine greatly needed, not only in the Treasury of the
United States and its sub-treasuries, but in banks,
counting house and other establishments whose large
sums of money must be totaled constantly

Not until Mr John P Buckies invested his money

Not used as John F suckes invested in money counting machine, however did the Treasury officials believe that mechanism could take the place of the human brain. But the single machine of its kind in the world now counting is underest money in the base-ment of the Treasury at Washington, is the first of a ment of the Treasury at wannington, it he ment of a larger order and it is expected if the twelve machines now being made for the Treasury prove the possibili-ties indicated by the present machine to equip the Treasury with large numbers of them, as well as the

Mr John P Buckley is a special employee of the Treasury Department whose work it is to devise make and install special labor saving devices

Certain plans was understand for a money counting machine Mr Buckley was invited to make it. He looked at the plans and said, All right—but I can make a better one

Make both and we will see was the order given

So Mr Buckley built the machine from the plans, nd then designed and built his own and when they and then designed were tried side by side the Treasury officials threw

Take the other thing away, they said. machine is what we have been looking for!'

It may seem to the inventively inclined that a bill

counting machine is not particularly difficult to make Any rotary mechanism into which bills are fed could be attached to a mechanical counter and would count perfectly so long as bills are put into it. The trouble with all such mechanism is that a revolution of the machine would count a bill whether a bill were present or not What is needed is a mechanism which won t count without the presence of a green back" in wont count without the presence of a green back" in the mechanism Attempts to make such mechanisms which depended on the slight weight of the bill have been made before but are too delicate for constant

Mr Buckley's machine utilizes an entirely differe principle which is absolutely certain in its action

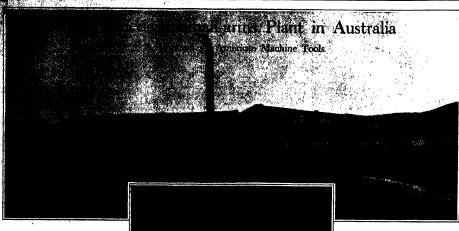
cannot count without a bill in the machine

The attendant sits before a low table on which is a The attendant sits before a low table on which is a small and compact mechanism in front of her are several small rapidly revolving rolls of a metal on top of which are rapidly revolving wheels of brass. These wheels and rolls are in contact, and through them runs a small (half supere) electric current. When a bill is fed in between the brass wheels and the rolls the circuit is broken The current has been actu ating an electric magnet. The instant the magnet ceases to act, purpus raise two flag doors to the com-partment toward which the rolls and wheels are feed-ing the money. The bill side were of the contract. ing the money The bill slips out of the rolls and reason these with the slips out of the rolls and reason these with the springs has actuated a mechanical counter The instant the bill is ejected by the rolls, the electrical contact is re-made the magnets pull down

the doors and the bill drops flat into the rack below When ninety nine bills have fallen into the rack below. the little doors fiy up as before for the hundredth bill, and count it, as before as it passes through the rolls. But the little doors do not drop down again, a n chanical trip holding them in place. This is the sign challest rety solventing casen in place. It was ince same for the operator to put a place of blotting paper or other separator on top of the hundredth bill. She than present a button and the doors drop, carrying the hundredth bill and its separator into the magasine

There are, in the present machine, three magnature, three sets of flap doors to them, three sets of rolls, and three counters. There is also a general count, which shows from one to one hundred en a dist, and

(Concluded on page 500.)



NOTABLE small arms manufa Aplant has recently been installed in Australia by the Government to manufac-ture military rifles. The contract was made under the auspices of the British Government, the rifle to be produced being identical with that with which the British army is now equipped, known as the Lee-Enfield.

THE PARTY OF THE P

This gun is one of the many adaptations of the original Lee gun—an American invention—the first one being made years ago in the works of the Pratt & Whitney Comno the works of the Fratt & whitney Com-pany at Hartford, Conn. The well-known Mauser is a Lee pattern, and the same principle is used in the guns of all the European armies. In the United States we call it the Springfield.

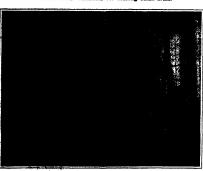
Bids were called for in London to furnish a plant to make Lee-Enfield guns at the rate of 50 per day. When Pratt & Whitney, the American company, applied whitney, the American company, applied for permission to bid, it was thought by the management of the Royal Arsenal that it would be impossible to make this plant outside of England, as it would be out of the question to have access to the British s, and the Australian gun had to abso lutely interchange in all its parts with the British weapon. The American experts, however, stated that if the British gun was made on the interchangeable plan, and their firm would be furnished wi it would agree to produce one that would interchange with the other, creating its own gages from the gun itself.

The arsenal authorities were very skep tical as to this, and remained unconvinced until it was actually accomplished.

When the bids were received it was found that the American proffer was found that the American profiler was almost identical in amount with that of the most favored English firm. The latter, however, included in its tender some seven hundred machines to produce 50 guns in a working day of ten hours, as against less than three hundred included in the American Md. This metrically sounded con-American Md. This, naturally, caused con-American wat. Tim, saturally, caused con-siderable discussion, as the American price was the same for less than half the num-ber of machines, showing the price per machine to be much higher. The two firms were then asked to state

how many working hours would be required per gun. The Americans gave a quired per gen. The Americans gave a guarantee that its plant would produce this particular gun at the rate of 25 hours per gun, while the Bughish firm gave just double this time, and indinated that the American firm cend not possibly make good its time; and called attention to the fact that in the Royal British American General something like 22 hours was required per gun. A most interesting strantion was thus created. Finally the Austrialian gun expert, Commander Clarksoo, was dispatched to American to investigate the subject, which he did in a most able and thorough





Turret lathe workroom

1.540

manner, the result being that he reported the art of granualting, as developed by the American bidder, to be many years in advance of anything that he had been able to find elsewhere; and recommended in the been able to find elsewhere; and recommended in the strongest terms that the award be given to the Ameri-

in firm, and this was at last done. It was understood that the British gun was being billed to the colonies at cost, which was figured at something over \$21, while the American guarantee as to working hours per gun meant a cost of about one third of this amount; in other words, on an order for 100,000 guns it means a difference in the cost of, say, \$800,000 against \$2,100.000

The arsenal plant set up in Australia is now completed and fully in operation; is accepted under the guarantee and paid

The machinery was tested before ship-ment for the manufacture of 100 guns, and it was shown that the 23-hour guarantee could be materially lessened. Some of the sample guns made at Hartford were submitted to the British War Office, where they were thoroughly and critically tested, and a report rendered that was most satis-

Thus an equipment of about 300 American machines was shown capable of pro-ducing double the amount of work that 700 British machines could produce, and there seems to be no other explanation of the

We frequently hear of the superiority of American machine tools, but it is seldom that such a clean-cut case of comparison can be had; hence this transaction is highly interesting

#### Australian Antarctic Expedition

THE ship of this expedition, the "Aurora," after landing two parties in Wilkes Land early in the year (1912) returned to Sydney The following (southern) winter was spent in oceanographic re-search south of Australia. Efforts were made to locate the reported Royal Company Islands, and the fact was ascertained that they do not exist at the position shown on the charts, though, owing to bad weather, it was not possible to be sure that no land exists in the vicinity. In fact, severe storms beset the ship through the winter and seriously hampered her work. A visit vas paid to Macquarie Island, midway between Australia and the Anturctic continent. The five men left here the previous summer by the expedition were found in good health and doing good scientific work Their wireless station was working spien-didly, with a radius of about 2,000 miles. Up to the time the "Aurora" left Macquarie this station had not been able to pick up any communication from the station which Dr. Mawson had planned to erect on Adelie

Land, in Antarctica, but it is reported that communication has since been established. The ship returned to Lyttleton, New Zeeland, July 11th After relating, was to start south from Hobart, Tasmania in the (southern) spring, for the south base of the expedition.

# The Parcels Post Zone System

#### The New Maps and How They are Used

By Emma M. V. Triepel, B.S.

THE work of preparation for the establishment of the parcels post is now complete, and the system in the United States and between the United States and Alaska, the Philippines, the Hawaiian Islands and

Porto Rico will go into operation January 1st, 1918. The law authorizing this service, which was passed August 24th last, provided that for the purpos parcels post administration, this country and its several possessions, except the Philippine Islands, should be divided into quadrangular units of area measuring 80 minutes latitude by 80 minutes longitude

identical with a area formed by parallels and meridiaus, repre-sented on appropriate postal maps or plans. of such units of area should be the basis of eight postal zones

The completed maps show the numbered quadrangles, with the eight zones which radiate off from the center of a given unit indi-cated by circles drawn at inter-vals corresponding to a radial distance of 50 miles for the first zone, which in-cludes the given-unit and all contiguous quad rangles, 150 miles for the second for the third.

6000 miles for the fourth, 1,000 miles for the fifth, 1,400 miles for the sixth, and 1,800 miles for the seventh. The eighth sone includes all units of area outside the seve numbers and boundaries of the quadrangles are printed

black, while the zone circles and figures are red.

The law directs that quadrangles lying partly in two zones belong to the one nearer the common center; so that the zone lines on the map, if drawn in strict conformity with the actual working out of the system in practice, would not be true circles, but would pre-sent a serrated appearance, corresponding to the procted units.

Each postmaster has been furnished a map showing the zones with relation to the quadrangle which in-cludes his post office, and a Parcels Post Guide con-taining regulations and the names of all post offices, with their unit numbers. No scale or other device for measuring distances or calculating rates will be used, as the zone map and guide provide all requisite in-formation Copies of the map accompanying this article will be furnished to the Washington, D. C., st office and all others included in quadrangle 1,071. Later, copies of the maps with reference to any given and the Parcels Post Guides will be sold for about the cost of production, to the general public

the cost of production, to the general public.

As an example of the method of procedure in mailing packages through this system, suppose a five-pound parcel is to be sent from Washington, D. C., to New York city. Consulting the Parcels Post Guide, we find that New York's unit of area or quadrangle is number 707. Referring to the map, that number is found in zone three. A glance at the table of rates, at the left lower corner of the map, shows that 27 cents will be the amount due.

Suppose a package weighing 4 pounds 3 ounces is to be sent to Benson, Arizona. Referring to the repro-duced page of the Parcels Post Guide, we find that Benson is located in quadrangle 4,385. Consulting the map, unit 4,385 is found in zone eight, with relation to Washington The three ounces must be considered as, a whole pound. The table shows that the rate for 5 rounds to vote eight is 60 cents. Suppose a 94-nound

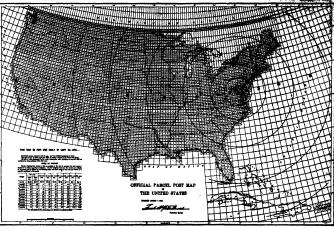
parcel is to be forwarded from Wathington to Chicago, whose unit of area is number 2,115. The map shows this quadrangle lying partly in sone four and partly in whose unit of area is number 2,110. The whose unit of area is number 2,110 area is this quadrangle lying parity in sone four and parity in sone five, so that it must be considered as Iying wholly must be considered as a sone five, so that it must be considered as lying wholly in sone four. The ¼ pound must be considered as a whole pound. Compiling the table, it is found that the cost of sending 10 pounds to some four it 62 cents. As a local example, suppose the Washington post office receives a 5-pound parcel addressed to 1840 B Street. Consulting the table given with the map, the local rate for 5 pounds is found to be 9 cents. These

Hence, purcels bearing cruss be treated as "Held for Posts be treated as a continuous properties of these special atamps, ranging in cont to a dollar, have been prepared and are a supplied to the postmasters. Percels will be only at post offices, branch post offices, left and atam armhered at loos amost stations, and such aum may be designated by the postinant not be accepted for mailing unless the card of the sender. The groundless of terminal facilities, automobiles and

tion of pre among the ques-tions involved ered by the Partes. One of its first acts was the issuance of hids for the purchase of 70,000 weighing scales for post offices. S many of the objects to be carfragile nature, the question of indemnification for jost and damaged articles will be an important

press business thus organised will not only cover all of the eve-

tation now utilised by private express companies, but will be extended to more than a million miles of rural delivery and star route service



The official parcel post map which will be used by the city of Washington.

THIS MAP IS FOR USE ONLY IN UNIT No. LOZI.

Weight	"Mt person.							-	
	Legal	Zono	rate		410	75te.	rate	700	+
1 pound .	\$0.05	\$0.05	\$0.06	\$0.07	\$0.06	\$0.09	\$010	\$011	\$0 12
2 pounds	.06	.08	10	.12	14	16	19	21	×
3 percent	47	-11	14	17	20	23	28	31	34
4 permits	- 46	.14	.18	22	36	30	- 17	41	-
5 pounds .	100	17	72	27	12	37	46	51	- 44
6 perends.	10	30	.26	32	- 18	44	56	61	71
7 pourds.	11	23	.50	. 37		51	84	.71	-
d proofs.	18	.86		47	.10	*	73	81	96
9 parent .	,13	20		4	56	-65	80	91	1.00
0 pounds	14	312	40	50	40	79	91	101	1.54
I promise.	. 15	.36	46	57	4	.70	100	1.11	130

The about the second of the second contains to the first live on the form the first Explanation of the map and the method of charging.

rates apply to rural delivery from the office where the route originates or from a patron on a route to the office where the route originates.

As an example of the application of suburban rates, suppose an 8-pound and 1-ounce package is to be sent from Washington to Annapolis, 25d. The Guide shows Annapolis' unit of area to be number 1,021. The some Annapois unit or areas to be number 1,021. The some map shows that unit 1,021 is it sessie one. The table indicates that the rate for 9 pounds in zone one is 29 cents. Articles, to be mailable, must be not over 11 pounds in weight nor more than 72 inches in length and girth

in weight nor more than 72 leades in sength and girth combined, nor likely to liquic the mails or postal equip-ment or employees. There will be a flat postage rate of 1 cent per ounce up to 4 outjoes, regardless of dis-tance. Above, 4 ounces, rates and by the pound and vary with the distance as shown by the table printed

The law provides that postage on all parosis shall be prepaid by affixing distinctive parcels post stamps.

#### To Our Subscribers

W E are at the close of another year—the sixty-eighth of the Schentific American's life. Since the subscription of many a subscriber expires, it will not be amiss to call attention to the fact that the on amiss to call attention to the fact that the sending of the paper will be discontinued if the sub-scription be not renewed. In order to avoid any in-terruption in the receipt of the paper, subscriptions about he renewed before the publication of the first me of the new year.

To those who are not familiar with the Scientific AMERICAN SUFFIEMENT & word may not be out of place. The Scientific American Sufficient contains articles too long for insertion in the SCHENTIFIC AMERICAN, as well as translations from foreign periodicals, the in-formation contained in which would otherwise be in-Supremental contained in which would otherwise be in-accessible. By taking the Scientific American and Suprement the subscriptor receives the benefit of a re-duction in the subscription price.

#### Electrical Ship Prepulsion

Effectives Ship Propulsion

M ARINE engineering experience shows that the motive power for driving the propellers of essaying
ressels should be easily and quickly reversible, capable
of being speeded up and down quickly, and able to run
economically at almost any speed for long periods in
smooth or rough water with less than sight per cent
deviation. The mechanic and have be simpled and
fawest working parts. The fact that shectrically driven
ressels sits the outly case consighing with those requirements was the outly case consighing with those originarments was pointed out in a recent paper read soften
an English estimates greater. Attention the sites
and power sementians plants may be placed will give
vary, stylis, then driving actions may be intention on
the state at the lines of the skip will sities.

# geh Ardrealic Tunneling

The state of the s

The having been embedded in sand under Broad-my at the south and of the tunnel opposite the side of Murray Street, some eighteen or twenty below the surf surface of the street, for more than three years, the Beach shield, regarded as the sin its line, was cut apart, and removed from sting place on December 2d by the Degnon Config. Company, the builders of section two of the fruntrack subway under lower Broadway, belwellers street and Mail Street. During this ried the wood portion of the shield, which was idented between the Front and rear iron rings, had completely disappeared, but the iron parts were as complete as when originally installed. The dighteen primitive propelling rans were in good condition, the sever threads at their insig each, where the inlet pipe is strashed, were perfectly fresh and good as if they had just been made. The iron inlet pipe was secured to the ran by a very heavy thick brass nut. The quarter inch thick iron hood, over two feet wide by about twesty-seven feet long, except for a small film of runt on its surface, was in serviceable condition. It of rust on its surface, was in serviceable condition. It capped the cast iron rear hydraulic ram ring and was secured to the woodwork just ahead of the ring with 414 inch long iron holts, having flat heads on the outside. The boits were attached to the hood on its oval, a few having been reduced in diameter by

The interesting feature is that this machine was made and operated by manual power day and night under Broadway with the heavy omnibus traffic going on overhead without in the least disturbing the same, oving only the actual amount of easth the tunn was to occupy, and this before the age of steel and electricity as we know it to-day.

When the tunnel was being bored and the shield was When the tunnel was being bored and the shield was near the north side of Mistrray Street a beavy stone wall was encountered; by careful management the stones were removed in frout of the shield, leaving an arch in the wall near its top. When the opening through the wall was large enough the shield was pushed through it into the sand beyond. No one present tarrough it into the same beyond. No one seemed to know why the wall was there; it was conjectured that it might have been the remains of an old Dutch fort. Since the ercavation for the subway, some forty feet below the street surface, the supposed feat issues out to be. fort turns out to have been a large cistern of some kind and is probably one of many that used to be located in the center of the streets to supply water before water pipes were introduced. The parts of becare witer pipes were introduced. The parts of the Beach shield have been sent to Ithaca, New York, and presented to the College of Civil Engineering of Cornell University, of which Mr. E. R. Haskell is Dean, by Mr. Frederick C. Beach, son of the inventor, Mr. Alfred E. Beach (now deceased), where it is to be set up and restored for permanent exhibition. Mr. Alfred E. Beach was granted a patent on this shield in 1869. Particulars relating to its construction may be found in the SCHENTIFIC AMERICAN of March 5th. 1870, and its use in tunneling under rivers on a large scale is described in the Scientific American Supple-MENT. No. 764, of August 26th, 1890

#### The Problem of Providing a Radium Container

W HEN making use of radium, some suitable con-taining vessel is needed, but glass or aluminium, which are commonly used, stop off some of the rays in each case, so that such rays are not allowed to act. This M. Lieber proposes to remedy by using a sur-face layer of radium compound applied as a coating on a suitable backing. To prepare the conting he dissolves the radium salt, in the case of coating upon celluloid, in other, acctone or the like. The celluloid takes the shape of disks or rods and these can be dipped into the solution or the latter can be spread in a thin layer on the surface. After evaporation, the radium is dis-tributed in a uniform layer in this way, and the solvent is chosen so that it adheres well to the surface. solvent is chosen so that it adheres well to the surface. When it is desired to use the raidum in direct contact with Haulide such as blood or other liquids of the body, solloidon coating is given to the layer, and this allows the seamntique and raiso the e-rays to mas, as is proved by experiments. The method allows of obtaining powerful effects with a shall known for obtaining powerful effects with a shall known for raidum, without could not have been secured before, and radius, which could not have been secured before, and all the senantions of the radium are utilised. It should be noted that the streament of lupus and cancer requires the 3 and 7 rary which are produced exclu-sivity by the senantions, and these latter are well obtained here in a continuous manner. Celluid tubels existed on the inside can be used for treating minoral water by the rays so me to have these showed by the water. Buth takes so me to have these showed by the water. Such takes so as be employed for inhalting and though them is treating lang diseases, as the air stilly isomes charged with meltium. By conting class concessions either the still of the continue that the continue can be put directly upon these so me to study the soulous of waters more more only the soulous of waters more more observed.

翻翻部门 独唱 山山川川

#### Correspondence

[The editors are not responsible for statements ade in the correspondence column. Anonymous com unications cannot be considered, but the names of correspondents will be withheld when so desired.]

#### Yards Per Second

To the Editor of the SCIENTIFIC AMERICAN:

In your September 28th, 1912, issue you have an interesting article entitled "Why Not Feet per Second?" As you state in this article, it is quite true that we use the term "miles per hour" even when calculating rates of term 'muse per nour' even when calculating rates of speed for very short distances, and your suggestion that "feet per second" be generally used is a very good one. In this connection, would it not be better to use the

in time sonnection, would it not be better to use the phrase "yards per second," rather than "feet per second," in view of the fact that "yards per second" is approximately one half "miles per hour," and likewise "miles per hour" is approximately two times "yards per second"? Do you not think the proportions one half and two times above mentioned, preferable and more convenient in calble and more convenient in calculation than one and a half times and two thirds as m oned in your article?

Yokohama, Janan.

#### The Pilot Charts and the Weather Bureau

To the Editor of the SCIENTIFIC AMERICAN:
Your editorial in the current issue of the SCIENTIFIC
AMERICAN regarding the renewed effort on the part of
the Weather Bursau to take over certain of the work of AMERICAN regently to take over certain of the work of the Weather Bureau to take over certain of the work of the U. S. Hydrographic Office is quite apt and to the colnt. Without detracting in the least from what good the colont. Without detracting in the least from what good the colon of th were a the vessure Tourean ready toes, it is perment of an effort designed primarily to help the farmers of the cour-try—hence its identification with the Agricultural De-partment. Its expansion along with other lines for the

general public sabore is a logical evolution which will cover a sufficient field if it halt there.

The Pilot Charts issued by the U. S. Hydrographic Office are the combined fruit of the professional experi-ence of our naval men and the civilian scafarers of all nations, and this product of co-operation is the conse-quence of that fraternal feeling which is a part of the mutual respect born of hazards shared in common. The mutual respect born of mazards shared in common. The sailorman, therefore, feels strongly when the documents and guides for his safety upon the sea are menaced through the editorship of landsmen, who are out of touch with the sea and with whom the merchant slipper can feel no inspiration to co-operate. It is this very sentiment of fellowship and understanding which now brings to the U. S. Hydrographic Office so much material of interest ROBERT G. SKERRETT.

New York city.

#### The Mississippi Problem

To the Editor of the SCIENTIFIC AMERICAN For a few weeks I have been a resident in the upper edge of the great coastal plain, and have been studying the edge or the great coasta plant, and nave been studying the river problem, so apparent in the great bend just below us, and none the less between us and the Gulf. The last hill overlooking the Mississippi River on the west is Commerce. Mo. Not far below, across the lowlands, is the St. Francis River, which seems to lose itself in the sunken lands of Missouri and Arkansas. To cut a canal to this stream, which could easily be widened and straightto this stream, when could easily do widened and straught-ened, would not be a great task. Just above the mouths of the White and Arkansas, and across the same to another stream flowing into Red River, the cutting would be surprisingly small. Already the surplus water of the Mississipli is finding a way up the Red to the opening of the Atchfalsya and saving a hundred miles to the ses. An examination of the route I have indicated shows an

An examination of the route I have indicate shows an easy way to solve the river problem. This has been suggested by others, but is receiving less consideration than it deserves. The fall of the water would be about 800 feet. Looks might be a necessity in low water. A fine ship canal outting off at least 300 miles, as measured by the canal outting off at least 300 miles, as measured by the river, would be a boon when the Panama canal is in opera-tion. The flood of the Mississippi could be drawn off sufficiently to prevent the disaster incident to the usual high waster along the lower reaches of the river. The river would raise its bed from deposits less rapidly, and the necessities of the repair boats would be reduced. The river is being navigated without the 14-foot channel, and this would not be interfered with in the least. It would give two water routes instead of one. The energies of the give two water routes instead of one. The energies of the Government, so acon to cease on the Ishhmus, can be employed to no better advantage than in solving our river problem. It is hoped the citizens of the central valley will not allow this movement to be forgotten.

Of two Regards, Ill. C. W. CAMPBELL.

#### The Bath Tub Decision

To the Editor of the Scientific American:
Your attention is directed to the second paragraph of

the editorial entitled, "The Bath Tub Decision and the Patent Law," appearing in the Scientific American of November 30th, 1912, and especially to the statement therein that "Had that price been determined by the owner of the patents, as in the rotary mimeograph case, and had there been no combination of licensees, the decision of the Supreme Court would have been different."

decision in the Bath Tub case rest on the fact that there was a combination of licensees in restraint of trade within the prohibition of the Sherman law. Clearly, if the combination to restrain trade in an unreasonable manner could not be shown, the grounds for prosecution er this law must disappear.

The fixing of prices is an element of the restraint exercised by this combination; but in the absence of this element another might well be the foundation of such restraint, and I have read the decision in vain to find any foundation for the inference expressed by the SCIENTIFIC AMERICAN, that the fact of determination of praces by the combination, rather than by the owner of the patents, had any other bearing on the decision than to indi-

te restraint of trade by the combination.

The question as to whether a patentee may lawfully impose restrictions as to the price of an unpatented article, in the manufacture of which a patented article is used, is not decided by the Bath Tub case. Indeed, the Court expressly declares in its opinion that the deci is made "without entering into the consideration of the distinction of rights, for which the Government contends, between a patented article and a patented tool used in the manufacture of an unpatented article."

secordingly, it is thought that the statement noted is misleading in so far as it includes, as a ground for the de-cision, the question of whether prices are determined

by the combination or by the owner of the patents.

Washington, D. C. E. H. MERCHANT.

[It is true that in its decision the Supreme Court used this language: "The added element of the patent in the case at bar cannot confer immunity; and this without entering into the consideration of the distinction of rights for which the Government contends between a patented article and a patented tool used in the manu-facture of an unpatented article." Our editorial was cer-tainly not intended to convey the impression which our correspondent states was conveyed. The Bath Tub case clearly fell within the Sherman law Our only point is that had there been no combination of heensees, had the er of the patent granted beense and fixed the prices sion, the decision would probably have been without collus different.—Epiron.

#### The Prone Position for Aviators

To the Editor of the SCIENTIFIC AMERICAN:
Time and again it has been pointed out in the columns
of this and other journals, that a stricter observance of streamline forms and sections in the design of an acroplane would result in a marked increase in the craft's efficiency. In view of this, it might seem rather surprising at first sight that, though the principle has been very faithfully followed in the best machines as regards the design of wing profiles and certain other elements, so far no serious attempt has been made to construct a machine in which the aviator, engine, fuel tanks, etc., are totally inclosed in one streamline body.

The reason for this, however, is not an ignorance on the part of constructors of the advantages to be gained from such a form, but rather an acquaintance with the difficulties that underlie the construction of a machine such as would render the inclosing of the aviator prac For they realize that the increase in cross-section required to inclose one aviator in a sitting posture, would necessitate a greater loading to obtain the highest effi-ciency; and with the addition of weight, fresh difficuleeney; and win the addition of weight, ress dimen-tice arise. Provision for variable surfacing would be absolutely essential in a large machine (for efficiency), and this latter has not been worked out as yet. Also, a more substantial running gear would necessarily need to be provided, and this again would involve an increase of head resistance
But there is one way out of the difficulty which the

writer has never seen proposed. Man's upright position is little calculated to cleave the air with least resistance. The position of the body which would offer the minimum. ad resistance in flight is the prostrate one and the writer suggests that the aviator he along the car with his body curved sufficiently for comfort. It would be a simple matter to work out the details.

Now this idea may seem somewhat fanciful; but flights in such a machine would undoubtedly do more toward impressing upon constructors the remarkable efficiency of the form, than any amount of theorizing or even of laboratory experimenting. It may seem more dangerous than the sitting posture; but the impetus given to the design and construction of a practical weight-carrying machine would justify the danger, such as the per-formance of dips, and dives, and other equally fool-hardy evolutions in midair (infinitely more dangerous)

ever has nor will. Whitby, Ontario, Canada.

# Catapulting a Hydro-aeroplane from a Fighting Ship

#### Adapting the Flying Machine to the Requirements of the Navy

By Robert G. Skerrett

BY the testing of an apparatus for the haunching of aeroplanes from a ship, Capt. Washington I. Chambers, U.S.N., its inventor, clearly proved that the hydro-aeropiane may take its part as an essential feature of the equipment of all berre men-of war It is doubtful if the general public realizes the prophetic significance of that performance at the Washington Navy Yard on the 12th of November. It marked a stage in the adaptation of the acropiane for service with the fleet which began but two years ago, and was practical evidence of the surmounting of difficulties which were most discouraging in the early stages of the work. Appreciation of what Capt. Chambers has accomplished can be had by reference to the history of previous efforts described in these columns, of the scout cruiser "Birmingham" at Norfolk, where upon her forecastle deck was built a temporary wooden platform.

The next attempt was from the "Penn-sylvania," and both served to prove that the aeroplane could not be a part of the fighting fleet if runways of so extensive and interfering a character had to be

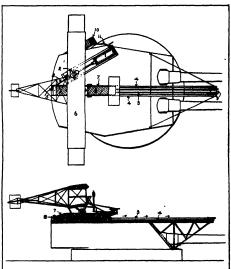
ected upon a vessel's deck. The next development was Mr. Glenn H. Curtiss's hydro-seroplane, and he contimed to improve it till the bost could return to its base by alighting upon the sheltered water on the lee side of the ship and then be picked up and landed abourd successfully, but it had to be started on its scouting from the deck of the man-of-war.

pt. Chambers has long been one of our torpedo experts, and his early experience in launching those weapons from above water gave him a helpful hint, and his catapult tried at Annapolis some ing an aeroplane into the air upon a short truck, and giving it in that distance the necessary headway required by the highspeed flying machine. Compressed air s the motive power and the launching device was mounted rigidly upon the wharf The aeroplane was set upon a car which traveled upon a track about 35 feet long, and both were free to lift from the rails during any part of the travel or after the aeroplane motor had started and had reached a sustaining The full air pressure, of 290 pounds, was turned into the cylinder which operated the cable attached to the car. There was no gradual acceleration of the translation of the supporting ve-hicle—it started forward with a jump! Upon the occasion of its trial, with th aviator in his sent, the aeroplane lifted at about midstroke of the piston. A cross wind was blowing at the time, the right wing was forcibly lifted, and the flying machine tumbled with a corkscrew motion into the water; also the pilot, Lieut, Ellyson. The test in question was two-fold in its purpose—to project the aeroplane into the air after a short run and



the Instant of leaving the catapuit, with Liout. Theodore H. Ellyson at the wheel.

The launching car of the cataput is seen below the pontoon in the act of falling away toward the water.



Plans and side views of Capt. Chambers's catapult for launching scropis from battleship turrets.

Cataput motor operated by compressed air from tank 10. (11 air of
 Pulleys that multiply the movement of the tractor cable.
 Tractor cable the cataput motor with car 8. 4. Balls on which car 8 runs.
 Cable.
 Flying machine.
 Float of hydro-aeroplane.
 Car.
 Pulley.

to observe the effects upon the avistor and the various parts of the apparatus. It was feared that the shock might derange the motor and other parts of the hanism and incapacitate the a plane so that it could not take up the work of its own propulsion. Quite nat-urally, Capt, Chambers and his associurally, capt. Chambers and ms associ-ates were gratified to find out that no part of the machinery or the fittings was ruptured or weakened by that venture-some performance. The fact that the

Market Commencer Com

some performance. The fact that the geoplase and the aviator were given a ducking was of secondary importance. Profiting by the lessons learned at the Annapolis trial, Capt. Chambers devised the catapult tested so successfully at Washington, and what this means in the way of advance can be gathered by com-paring it with the platform that was paring it with the platform that was necessary when Ely made his flights from the U. S. S. "Fennsylvania." The present launching apparatus is so small that it occurries but little susce: it can even be be quickly moved to any position on the ship; and it can be readily dismounted and stowed away clear of the sweep of the guns. As in the case of the Amapolis device, compressed air is the source of motive energy, and this is always available on ships carrying torpedoes or using compressed air for other purposes. The sary air, at a suitable pressure, is stowed in a small cylinder on deck conveniently located for connection with the catapult. The piston of the cylinder has a stroke of something like 40 inches, and the piston-rod movement is multiplied by means of a wire-rope purchase, and this wire rope draws forward the small wood-en car upon which the aeroplane rests. In order to launch the flying machine, both it and the car are projected from the rails at the end of the run, and this takes only 1½ seconds of time. The car simply drops out of the way, and if the rails reach to the side of a ship, the vehicle is recovered by means of a rope attached to it. The car gathers headway smoothly; there is none of the shock which characterized the operation of the which characterized the operation of the ploneer apparatus at Annapolis, and this is accomplished by a clever arrangement which controls the increment of the air pressure automatically, and thus grad-ually accelerates the forward motion throughout the entire stroke of the pla-ton. At Washington, the catapuit was placed upon a float and the bottom of the hydro-aeroplane was not more than 2 feet above the water. This did not provide of a margin for the machin ere its motor took up the work of propulsion. However, when the test was made, the fiying machine arose gradually and steadily upon a beautiful flight as soon as it left the rails, and there was not the alightest tendency to seek the water. is true that the float was pointed to the wind, but at the time of the trial the



A preliminary test of the catapult.

The car was loaded with heavy analogs to represent the weight of the dying mach of the lost like block uppermost in the sir was held to the car by the same held most strip, that serves to secure the bytro-scapina until the momant of its desirable. The relatively light car is seen failing away from the heavy simplege and out which piezed the part of the dying another.



The cateput just before the machine was launched.

Before the fring machine is househed the estapuit is placed open a float and the bettom of the hydre-exceptance is not more than two feet above the water. This does not provide much margia for the 'machine to day for it in motor takes up the word groupulson. The machine rises gradually and seasifully upon its light without may be observe the water.

A CARTA

desiry data. Just the same, the sense was of each or character than the sense was of soft a character than the sense of the casquit for service showed as Certainty much credit to fue Lieutano for the nerve and courage be has early in eagerly offering himself for the seeks, and this fact gives additional wave to the claims now made for the claims. It is of interest to note that the demonstration at Washington-stray to that at Annapolis—the accountry to the carby in the cast plan the carby in the second that the second the strain this sequence is the carbon the second that the second the second

Because of recent improvements in the hydro-aeroplane and the development of this catapuit, Capt Chambers confidently predicts the following uses of the fying machine in naval warfare, and these give us an impressive idea of the way the art has advanced in the last two years:

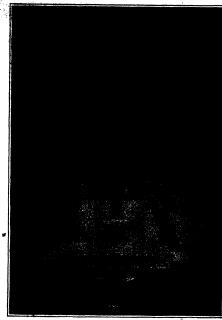
They can be carried, stowed, and used by all large ships for the purposes of:

- Reconnoitering an enemy's port or to search out his advanced bases and to assist in the operations of a blockaded or of a blockading force.
- To locate and destroy submarine mines, submarines, and dirigibles, and to assist in the operations of submarines and torused heats.
- To damage an enemy's docks, magasines, ships in repair or under construction, dirigible sheds, and other resources.
- 4. To provide means of rapid costideutial communication between a fact commander and the commanding officer of a co-operating force on shore, or the commander of another fact or division. They can be carried by all scouts and
- 5. To extend the "eyes of the fiset" in naval sconting.
- They can be carried, with ample supplies and camp outfit, on board any naval
- pues and camp outni, on soard any navai supply sixiliary.

  6. For scouting at advanced bases and for extensive use with expeditionary

#### A Notable Great Lake Passenger Steamer

THE 'American river steamboat is a peculiarly American type, standing in the same relation to steambly in general as does the multi-marted American schooner to the sailing ship. Its strongly marked characteristics are due to the influence of local conditions of navigation and to certain national demands in the way of 'confort and general accommodations. Whether it be found on the Mississpir or the Hudson, or in the sheltered waters of Long Island Sound, there are certain leading characteristics which



Capt. Chambers's catapult for aeroplanes.



High and low-pressure cylinders for the "City of Detroit III."

Diameter high-pressure, 42 inches; low-pressure, 92 inches; stroke, 102 inches, horse power, 8,000

make the type readily recognizable, and differentiate the American craft from any other of its kind in the world.

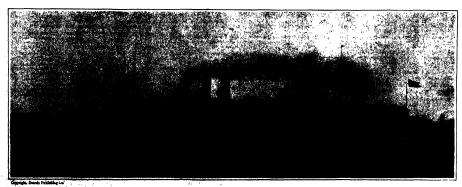
To our thinking it is the most picturesque and impressive of all the stately vessels which carry the world's commerce; and although the largest of them are but haif as long as such ocean liners as the "Olympic" and "Imperator," the effect of their imposing and many-storied tiers of stateroous, and the long, clean lines of hail and superstructure, is to deceive the eye into thinking them greater than they are—an effect which is heightened by the fact that they are generally seen against a background of small river craft or against the moving patternam of river lank or proximate shortlym.

bank or proximate shoreline
To those of us who are familiar with
the majestic boats that ply on the Hudson
and Long Island Sound, it will be surpris
ing to learn that the growth in size of the sidewheel passenger steamer on the Great Lakes has been so rapid that to-day the largest vessel of this type is to be found on those waters. We present illustrations of this steamer, the "City of Detroit III." which has been built for the service be-tween Detroit and Buffalo. The principal dimensions are Length over all, 470 feet; keel, 455 feet; breadth, 55 feet 4 inches molded; breadth over guards, 96 feet 6 inches; depth at stem, 22 feet; depth at stem, 20 25 feot. The hull is built of steel with double bottom. It is divided into eleven compartments water-tight, cross bulkheads, extending from the keel to the main deck. The bot-tom is divided at the center line and athwart-ships into fifteen water-tight tanks. There are two decks below the main deck and three above. The main deck and housing on the main deck and orlop deck are also of steel A steel superstructure is carried to the main deck. The ceiling of the saloon deck is sheathed with galvanized fron, practically making the entire housing up to the saloon deck fre-proof. A steadying tank of 100 tons capacity is provided amidships to check

rolling in heavy sea.

The shift is driven by paddle-wheels; and she is the longest paddle-wheel steamer a float. The engine is of the inclined, three-cylinder, compound, jet-condensing type, having one high-pressure and two low-pressure cylinders. The estimated indicated horse-power is 8,000 at 30 revolutions per indust. The high-pressure cylinder, which is 62 inches in dismeter, welghs 47,200 pounds. It is placed between the two 92-inch diameter low-pressure cylinders all having a compound platon stroke of 102 inches. The high-pressure cylinders have Corlines with each goar and goar All the valves are operated by ordinary double-bar Nicerusion link motion,

(Concluded on page 51'.)



"City of Detroit III," largest side-whool steamer affoat.

# Working a Whistler

### A Dangerous Task That Requires Skill

By C. H. Claudy

S EA-TRAVELERS up and down our coast lines often hear a strange, welrd sound to port or starboard, a sort of compound of moan and shriek, at once soft and insistent, subdued and penetrating. It is the call of the whistling buoy to the man at the helm, It is warning him of shoal or dangerous place, giving him his hearings, by which he may steer his vessel in each

e whistling buoys, which are enormous masses of fron, often weighting several tons, are as simple in principle as they are certain in operation. The buoy proper consists of a huge peer-shaped bulb, listils end up, on top of which is a powerful whistle, protects from accidental blow or collision by a framwork up, on top of which is a powerfur winstie, protected from accidental blow or collision by a framwork of fron hars, and an air intake. Below and projecting far down into the water is an open tube of metal. The whole thing is secured in position with an anchor and a chain, which last is long enough for the depth of the movement of the mass up and down.

When a wave lifts the buoy up in the air, the water

left there for an indefinite period of thise. But the set has strange wars with her plaything, and, twis-if the necessity of censeant painting of the boor to protect it from the action of sea water was not existent, it would still be necessary to keep a watch on these ent, it would still be necessary to keep a watch on these signals, and to take them up and replace them rather offici. For the big tube projecting down late the water is a great attraction to barancies and six word, and not infrequently these marine growthe so interfere with the light on of the boar so to keep it dilute in ordinary weether and to dim its votor in high weather. It it then becomes necessary to "weight" a new whiteler it then becomes necessary to "weight" a new whiteler

It then becomes mocesary to "willip" a new whitelers in position, which is a require part of the duty of a lighthouse tender or busy bonder, of which vascale there are many in the Lighthouse Service.

When a busy is to be "worked," the issuiter repairs to a yard or station, and by means of her cranse, lifts on deck the freship painted and theoremist require more busy, which is to replace that one whole is either etlent or which has served its allotted time and is not due for replacement.

saligher and chain toused arter is, the number operated in presented or two whiching bears, cide by sides. It was the property of the property

Ber'ft getting the new bony overhoant is despertisely worst, hauling the old one in a more so. The they is first sequent by good ecamanship, managing the season Worships from this, ropes, chains and "quetings" or hearty-scales are brought too play and the whole very cistificacty littled and secured as it comes over the side. It is allowed to swing free not at all, sawy perhaps for an inelata, jet as it is taid all ato on the desk, and then, apparently in the very face of death, a down men spring it the man, ready to wring with the waves and to describe them, and thrust huge billots of wood



A monater whistling buoy, which has been damaged by being struck by an ocean liner. Tube cut in half by propeller blow.

in the tube, setting as a piston, sucks in air through It is confined in the bulb of the buoy the intake a simple valve which prevents its egress through the intake. When the waves drop the buoy in the trough of the waves, the water in the tube presses up on the confined air and compresses it. It finds exit through the whistle, which thus sounds its warning note.

Whistling buoys are only placed in water where the wave action is fairly constant, so that calms and fair weather will not stop the action of the buoy any more than can be helped. It should be noted, however, that the busy is less needed in fair weather than in foul, and that it takes comparatively little disturbance the water to make the buoy sound its warning. The higher the waves, of course the louder the sound

There are eighty-eight of these buoys at present in service in this country, and twenty-five whistling buoys which are also light buoys, showing a visible signal at night. They differ in size, from the small ones used in harbors and where the sound need not be very powerful in order to reach as far as may be necessary, to the huge masses of iron which are given to the water as a plaything at the entrance to harbors or wherever a shoal needs a warning signal which cannot, or for

other reason should not, be cared for by a lighthouse It might be supposed that, having no mechanism bu a valve, such buoys, once put in position, could be

There is nothing difficult about this: it is getting the ously large and unwieldy mass of iron and taking on board the one which is in the water, which causes the difficulty. The very waves which are necessary to the successful operation of the isosy nake it hard to manage at the end of a crane on board

make it hard to manage at the end of a crane on board a comparatively small vessel. When a buoy tender goes to "work" a whistler she clears her deck of everything else but the buoy, which is secured with chocks and chains against the roll of has secured wint cancer and cannin against the visit of the vessel. The old budy is approached cauthously, within a couple of hundred feet, and the new budy is allowed to slide overboard, rather than picked up and placed in the water, the crye guiding it by gur royse while the powerful crane lifts just enough to permit while the powerful crane inva just delugate to the busy to more. With the vessel slowly rolling side to side on the slow seal of even a quiet day-good days are purposely picked for this work—the. of freshly painted from with its long tube pre-potentialities for evil which haust be closely was potentialities for will which must be closely watched. Let the busy but get classe, of the deet and the fall tackle get jammed, and these would come into being a three-ton pendulum with an iron fail, thirty-siz feet long, capture of smanking the best to that and certainty of sweeping broken-boned men about the deek with no

more effort then if they were so many files.
When the new buoy is safely into the water and its

underneath its lides, to hold it long enough for last-ings to make it secure. The beat, being belayed to the anchor chair, then cartifoutly being sway to raise the anchor, perhaps buried for menths in the mud, and there is a general scampering away from the cable white this is being done, as should it break it would be like having a couple of cannon balls come tearing along the dock; a breaking two-inch cable is as rigid as an iron bar and with hundreds of tons of force in

as an 17th har and with hundrede of tone of force in the swift field, through space. However, so skillful are those hundreds of heavy massion of iron on an unstable level, that it is rere that the same of the same of those which course to whitefully below as we called either by shell being rain down that their tubes cut off yet by propalities of intight weesside or by their being damaging by the j.

I'M Germany menty horses are being shot's analysis of tarred roops. The shotes to be paged the form of the state of the state of the state of the state of these stones there by the a blick into which eith fortesten have been different analysis. The state of the sta

And the second of contribute to the second of some second of second of some second of second of

Section 1

#### Acceptant Vans for the French Army

Diffill time ago we called attantion to the base-drivent wate that water bests made by the base-drivent water that water bests made by the Pretech array for the transportation or ascoplanas. The Pretech that the present that the sample of the pretech array is seen of the pretech array of the pretech are the pretech array of the pretech array of the pretech array (after any later with a pretech array (after any later and machine tools used for the repairing of acceptance. The new motor transport wans effect a great saving of time in the moving of acceptance from place to place when it is not desired to send them by the air route.

#### A Violin Made of Matches

THERE are certain individuals who I have a penchant for putting to ourious use, materials that others consider worthless. Thus a man will make a clock out of bits of strew or a cane out for idd newspapers. Here is a picture of a violin, the body of which was built of matches. A man living in Bay City, Wisconstn. conceived the novel idea, and spent a year in the painsatking operation of constructing a muscal internment out of the refuse of the match-hox. "The instrument contains 5.400 matches," says the man who sear us the phetograph, and he also as sures us that the wildin has "ai-doil, sweet, mellow tone." which, if really so, strikes us as even usore remarkable than its peculiar construction. The instrument has been on exhibition at the Minnesots State Fair, where it attracted a great deal of

#### The Acase of Car Luxury

I no order to travest with all the convenition of the president century, and even to dine in privacy, or roads without being compelled to leave her car, a German singer of note has ordered at traveling linousine which must be considered the acuse of luxury. As the illustration shows, it can be converted into a dining room, completely sell functionally fitted. By a few deft touches it can be transformed into a "boudder," carf-roun or bedroom. The senta are adjustable so as to form a broad and comfortable davennor bed.

#### Girdling Orange Trees

DictureD herowith is a Washington navel oration weighing 5% pointed and measuring. 35 inches it accountment with the measuring 15 inches in decrementment within was green by Mc Bodert Horse his discountment of the second of the second or the second of the second or the second of the second or the second of th

Market of Mineral Months of



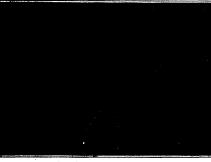
Motor vans and trailers for French army aeroplanes.



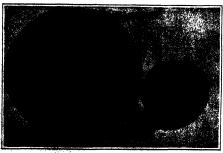
Anstrian army ultra-violet sterilizer filling a water tank.



A violin built of 5,450 matches.



A limousine converted into a dining car.



Glant orange produced by girdling, compared with a nonparell and a kumquat.

times girdled to obtain larger fruit, but this is usually attended by a diminution of the quantity of the yield. Nuch was apparently the case with Mr. Howe's orange trees; for as the size of the fruit diminished in successive years the quantity increases.

#### Ultra-violet Light Sterilizer for the Austrian Army

THE new French ultra-violet ray water purifying apparatus has been made up in portable form and is now being out by the Austrian army upon its first trials. As the apparatus is intended to be used for a supply of pure drink-ing water for troops in the field, it is a complete plant, containing its own ma-chines for operating pumps and producing electric current so that it can be set at any point on the field When on the road, the small front truck containing the er's seat and also a supply box is attached to the apparatus proper, which is mounted in the rear box upon a two-wheeled truck. When on the spot, the rear box is detached and opened up, and the sterilizing tank removed and set up on a tripod support so as to be within easy reach of the troops. Within the case is a well-designed plant consisting of a is a wentesigned plant consisting of a small gasoline engine coupled to a rotary pump and also to a dynamo. A losse leads from the pump to the source of water supply, such as a well or pond, and the water is pumped up and sent directly into the sterilizing tank if it is quite clear, or if not it passes first through a rapid filter. A short piece of hose connects the plant to the sterilizer, and electric wires also make connection with the dynamo so as to supply the mercury vapor lamp. A set of instruments serve to give the proper amount of electric current, and auto-matic devices cut off the current when the water is not flowing out of the tank, in which case automatic valves also stop the water supply from the nump The ent apparatus is likely to be valuable in keeping up the good health of the troops, as when on the field the water is often taken from polluted sources, and this is recognized to be one of the main causes of disease. Researches made at the laboratories of the Paris University by Prof. V Henri show that provided it is so clear as not to prevent the ultraviolet rays from penetrating below the surface, water which is heavily charged with coll bacillus and other most dangerous microbes, is rendered quite harmless Such microbes are, in fact, entirely de-stroyed by the powerful action of the rays, as is shown by numerous analysis

#### Artificial Marble

THE artificial, or stuce, marble is in the main part composed of gypsum, which should be hard, so that the product can be smoothed and polithed. To the finely powdered and several burnt gypsum marble dust is often added and the mixture gazad with water in which mucliage has been dissolved. The colors and the streaks or veins, the able initiation of which is the main object in the manufacture of artificial marble, are added to the dry mixture, as mineral colors, or during the hardening of the inheled product upon its surface by aid of chemical compositions.

To obtain streaked slats large bails of gapuin are kineaded with sanaler ones of different colors, and from the bail so obtained the slats are cut, which are laid upon the still damp base and then subject ed to high pressure. After hardening the slats are planed. To avoid this toll-some operation of planing, a sleet of glass, highly polished and rubbed with oil, is used. Colored than representing the velue are traced upon this sheet; then a §-inch layer of a tick mixture of giptum of the desired color is carefully poursed over the glass and left to harden. After land-ening the sish is carefully removed, and the surface next to the glass will be found to be absolutely smooth, and need no shaning.

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

# Wanted: A New Patent Office

Building
M CCH has been written and printed
recently with regard to certain needs
of the patent system of the United
States, and a bill for the complete re-Natice, and a bill for the complete re-vision of the patent laws has been before the Committee on Patents of the House, ever since April 12th, 1912. Whatever may be the arguments for and against this proposed revision of the patent laws and its consequent effect upon the indus-tries of the United States, there can be but one side only to another important need of the United States Patent Office. This is the need for a new and modern building to accommodate the working force of the office and to provide adequate and fireproof storage for the price-less records of more than one million

Uncle Sam has a good paying business in the United States Patent Office. He in the United States Patent Omes. He makes so much money there that after paying for every conceivable expense in the issuance of patents, including the salaries of the examiners and the clerks, he can count the handsome profit of more he can count the handsome profit of more than seven millions of dollars on deposit in the United States Treasury. But what would you think of a business man who made a profit year after year, a gradually increasing profit, and who used it

for his own benefit, or piled it up in the ing something in the way of a mossipally bank without putting some of it back into in granting patents, however, Uncle Stam the business in the shape of improved posters the provites and lets the Inseptants facilities? It is evident that such a man; and the Patent Office employees get along could not go along very faw without meet: an best they may. It is true hed did have ing a great alump in his business. Have a burst of generosity about four years



Issue and Gazette Division.



A cell-like storage room.

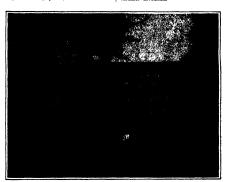
No sentight or outside air ever reaches this place; yet copy-pullers must work here getting out copies of patents by the aid of artificial illumination.

ago and raised the pay of his exact That was done, however, because was a constant procession of and was a constant precession of analysis through the office, and resignations to elsewhere and get more pay came so fi that the Commissioner felt that he co-

that the Commissioner rent that he could scarcely recognise half of his employees by sight and much less call them by name. The appointment of Commissioner Moore in 1907, however, started the ball Moore in 1907, however, started the ball to rolling for newer and better things. The salaries were raised and the examining corps placed upon the highest state of efficiency possible with the present salary rate. True, there are resignations now—law firms and corporations are always looking for trained mess—but the difference between the Patent Office salaries and the inducements offered is not as great now and more men stay in Washso great now and more men stay in Wash ington to perfect themselves in the knowledge of patents and patent law.

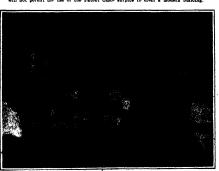
edge of patents and parent law.

This fast secontapiland, one would suppose that Mr. Moore was content to rest on his laurels. But not a bit of it. Scarcely had be executed this task safely than he began banging on the doors of Congress for money to improve the Patent Office building. Business was good, pleaty of money was coming in, and the employees were satisfied, but Uncle Sam still clung to his old-fashloned, thoroughly obsolete building.



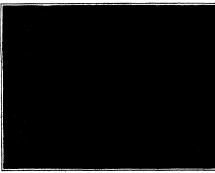
Patent Office Court.

A broathing space which must be sacrificed for a much needed addition because Cong will not permit the use of the Patent Office surplus to erect a modern building.

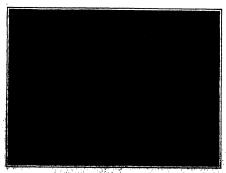


The paste room of the Patent Office.

ts are assembled. This is a room into which sumshine pever



A copy-puller on the left. Copies of patents atored between two outer doors, where



The state of the state of the

Solutions Assistant has repeat saled the extention of its readen sugment of this need. It has put successes from the Communication in which he has sturdily fough to parastation of Congress to either an an ly now and un-to-de

in a sentrely new and, up-to-flate thing said business equipment. Sow the liter is not, as might be sup-ed, to spend money on a showy and use building for the benefit of sight-ies in the Capital City. No such use the public's zoncy is contemplated, as used for a new Patent Office building a real one, not purely a crase for show-s off. It might be said, by those who se accustomed to see working people addled together in lofts and dark holes and corners tolling for their daily bread, that the present Patent Office is far bet-ter than the quarters in which some pecser than the quarters in which some peo-ple have to work. And it is possible, too, that the employees could get along, work-ing ten or twelve in a room, or in rooms where the cubic-foot supply of fresh air is far below the standard set by the laws of health. There are plenty of prece for such conditions. But what about But what shout the ds of the office? If common human ity toward employees is not a moving reason, there is a still more serious one at hand. If it were not for the gravity of the situation, it would be laughable to lngs and the restricted facilities note some of the expedients adopted in existing. cramped quarters allotted to the Pate, quarters in which human beings must work, desk by desk, cheek by jowl, occupied in important technical jowl, occupied in important technical work, nerve-racking and brain-teasing, and in which precious papers and docu ments are piled from floor to ceiling, gathering dust and dirt. It is as if a house had no closets and all the family's effects

were strews about willy-nilly.

This is a condition which should and does concern the people at large. They are directly and personally interested in the records of the Patent Office. The destruction of valuable assignments of pat-ents, whereby the titles to inventions are held, might mean the loss of millions of dollars to the commercial world, and deal a staggering blow to the nation's business

integrity.

Every week an average of nearly a thousand patents is granted. Every week space must be found for the records in these cases. They must be kept conveniently, too, because they constitute works of reference, and are consulted daily. Then, too, space must be found for the printed copies of the patents. More than a miltion United States patents have been granted, and copies of these are sold every day of the week. These copies must be so conveniently disposed that when an order for a single copy or a hundred copies is received by the office, the "copy can go directly to the plac puller" storage and extract the copies. A large force of boys is actively engaged in this and considering the makeshifts which are resorted to to find storage space, their work is anything but please ant. The corridors of the Patent Office are banked high with copies of patents on wooden shelves, where they are exnot only to dust and dirt, but to hee. This danger of destruction by fire also. the last is an ever-present one. A sign or match or ciparette carelessly tosse away might start a conflagration that would be difficult to check before it ac-

would be difficult to check before it ac-complished great destruction.

Aside from unitrisk vigiliance, the one-war to prevent this is by the construc-tion of a fireproof modern building for the Patent-Cillen. The preposal to do this has bein repeatedly urged upon Congress by the Genmalestoner of Francis in his respects, and before the committees. Bills reports, and before the committees. Bills have been introduced which had as their tim this limportant, spateure, but a cham-aton of the remeases de the halls of Coperation of the remains of the halls of Coperation that yet to be determined. This pulls the blacker equivalent consister up to the Congress, and is a poignant emisphe of the general wins, passed foolian policy of this general chair. "Editionary is one thing, said gastern chair." Editionary is one thing, said gastern.

ADMINISTRATION OF THE PARTY OF

in emether. So far as the Patent Office is essetter. So far as the Patent Office is concerned, the attitude of Cotagrees has been extremely negligant. The members overlook the fact that the Patent Office is a self-supporting bursen. Little question would arise as to the propriety of building a new post office in a town where the business had iong since outgrown its estimating quarters. Way, then, is the buildto do is to authorise an expenditure out of the present surplus in the Treasury which has been earned by the Patent Office—a sum of money which has been paid in by the inventors of the country, and which represents the net earnings of

The proposition is one of busin purely and simply. It is not good busi-ness to display your wares in wgly surto hang on to your profits, when their judicious investment would be sure to bring in more and better business. The lack of money has resulted in poor internal facilities in the Patent Office; and these same facilities have roundings; it is very poor business indeed output that is not as perfect as it should Of course, enormous improven

in system have been accomplished in the past few years, but perfection can hardly be hoped for among the present surround

"Give us more room" is the continual cry of the heads of the examining divisions, and the Commissioner is helpless to relieve the situation. He has parti-tioned off the last available inch of corridor, crowded in the last possible desk or dor, crowded in the last possible deak or filing case, and cleaned up the last adapt-able cellar or vault to make it fit for workers and documents. He has succeeded in getting into the sundry civil ion bill this year an item which appropriat contemplates building an addition to the present structure, a make-shift which is far better than none, but pitifully inadequate when the great needs of the office are considered. This addition, if the appropriation is allowed, will occupy the greater part of the interior court of the present building. This court is a small park, a breathing place for the en and its loss will not add to the light and ventilation of those rooms which face on the court. It was necessary, however, to make this sacrifice in view of the refusal of Congress to consider a measure for an entirely new building. But this is merely staving off the inevitable. Sooner or late a new and modern building must be pro vided. At the lowest estimate it will take five years to build such a structure.

At the hearings before the Senate Committee on Appropriations upon the item proposing to spend \$220,000 for a building to be located in the interior court of the Patent Office, Commissioner Moore stated some very plain facts as to the insanitary conditions of the building, and also the grave danger which threatened the rec-ords. In this he was backed up by Dr. Warren of the Public Health and Marine Hospital Service, who stated that the cubic feet of air space for each employee was only one third of what it should be was only one third of wast it should be, with no possibility, under existing condi-tions, or remedying this condition. Sen-ator Gallinger asked him whether he thought the Patent Office was a "tubereslosis factory," and Dr. Warren replied in the affirmative, and deplored the fact that little boys of sixteen years of age were forced to work in these dusty and ill-

cleaners are used and everything is care cleaners are used and everything is carrielly gone over frequently, but when things are exposed constantly, dust and dirt rapidly accumulate and the most careful "house-keeping" cannot keep up with the abnormal conditions.

You who live far from the capital of

the nation know little of the difficulties which beset those who are placed in adwho are placed in ading of a new Patent Office looked upon ministrative positions. Public buildings with such indifference? All Congress has one represents a struggle with Congress that has caused more than one official to give up in despair. High rents are paid for inadequate working quarters year after year, when a lump appropriation at the start would furnish space a-plenty and comfort for all time.

It is easy to set down facts, but hard to drive them home to those whose in-terest is courted. Every man who reads these lines ought to feel his personal interest in the matter of the Patent Office Even if you are not an inventor, you may become one at any moment. Even if you become one at any moment. never do, nor never intend to, you are a consumer, and as such profit by the inventions of others. If the patent sys tem of this country were not so excellent and so wisely founded, many of your daily necessities would be yet unborn For aught that is known, Edison, Maxim Marconi, Morse or Westinghouse might never have had that incentive which is furnished by the protective patent laws of the nation

What are a few hundred thous lars, or even a couple of militon dollars compared to the commercial supremacy and perpetuity which depend upon the

United States Patent Office?

Let the reader try to understand the simple statement, made as clear as pos-sible, viz.: The Patent Office has earned the money; it has the money; only Con a can give the authority of it for a new building to take the place of the old structure it now occupies Congress refuses. Result: Employee are unable to work under the best conditions, necessarily affecting the output of the office, and invaluable records are in danger of gradual destruction from posure, or sudden destruction by fire.

Ignorance may be as largely as indifference for the conditions which exist, but to be fore-warned is to be fore armed, and it cannot be charged agains the present administration of the United Patent Office that it has fa ersistently call attention to existing condittons

#### The American Patent System

DIRECTORS OF THE AMERICAN INSTI-TUTE OF ELECTRICAL ENGINEERS.

THE numerous bills now pending be fore the Congress and greatly modify-ing the patent system in the United States, have received the attention of the American Institute of Electrical Engi neers. Recognizing that the patent sys tem has been, and is, a tremendous facto in building up the present industrial properity of this country, thereby greatly contributing to the prosperity of the country as a whole, and that any untoward change in the patent situation might dis astrously affect this condition of indus trial and general prosperity, and the con ditions contributing to their continua ditions contributing to their continu augmentation, the Institute has pass resolutions, the more important of which are the following:

Prespect of the whole country; and chosen from different walks of life; and not more from different walks of life; and not more from different walks of life; and not more state of the life of life o

#### Notes for Inventors

Five United Shoe Machinery Company Patents.—The United Shoe Machinery Company, as assignee of Frederick M. Furber of Haverhill, Mass. has just so-cured four patents, Nos. 1,043,083 to 1,-043,086, inclusive, for cementing machines and a patent, No. 1.043,087, for device for applying liquid to shoes or other stock.

Improved Tire Fabric.--Harry K. Ra mond of Akron, Ohio, assignor to the B. F. Goodrich Company, has secured a patent, No. 1,043,143, for a tire fabric which fabric composed of a plurality of sections arranged bias with the transversely extending edges of each of the sections provided with a series of tongues overlapping and secured to the adjacent section.

The Real Inventor of the Telescopic ectacles.—In the SCIENTIFIC AMERICAN of November 23rd, 1912, we published an article by Dr. L. K. Hirshberg on "The Telescopic Spectacles." The author gave credit for devising the telescopic spectacles to Dr. K. L. Stoll, whereas Dr. Stoll was simply the first to demonstrate them in this country. Since this places Dr. Stoll in an embarrasing position, we call attention to the fact that the discovery is to be attrib-uted to Prof. E. Hertel, formerly of Jena, but now of Strassburg, Germany.

A Hand-operated Knot Tier .-- In patent No. 1,041,039, John T. Dalton and John Clayton Dancker of Baltimore, Md., present a hand-operated knot-tying implesent a hand-operated knot-tying imple-ment which includes a pair of pivotally-connected lovers with a knotter and a gripper carried by one of the levers and means carried by the other lever for operating the knotter and a cam carried by said other lever for operating the gripper.

Chemical Vessel to Withstand High Temperatures.—Byron E. Eldred of Bronxville, New York, who has assigned to the Commercial Research Company of New York city, has secured patent No. 1,043,-579 for a chemical vessel or crucible in which there is a core layer of ferrous metal which is completely enveloped and her-metically scaled in by a surface layer of a noble metal with the surface layer to the ferrous metal.

Two Peter Conner Hewitt Patents The Cooper Hewitt Electric Company of New York, as assignee of Peter Cooper

me the following:

The work in these dusty and ill.

The work is the work in these dusty and ill.

The work is the work in the work in

# The Horse-Cost of Living







# Annual Cost of Horses Compared to Annual Cost of Tea, Sugar, Meat and Flour

There are 25,000,000 Horses in the United States. According to the latest Government report, these herees work about 3 hours a day, and cost \$50 a year apiece. They cost us \$2,000,000,000 a year.

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Of General Interest.

MARCHL WATER—J. W. BUTCERSOON, 28

2nd Rt., Roundforcot, N. J. Zhii tungrovensist pertains to tolic articles and superfully to deviges used in dressing the hair, the special object being to provide a warry of a sheap, and single actume and white warry of a sheap, and single actume and white the provide and the state of the state of

ring as the best strikes, the water. FORBHIGHT FOR SMALL ARMS.—B. DR BERFOCK, 27 SOURCHLE VILLES, Expediações, London, Bugland, The lavaretion relative to foresights for fire-arms of all kinds and the object is to obtain which the user of a rife, pintol or like weapon cites, established to the control of the control of

conditions are suppressed spiritus.

APPLARTUE NO ENGINEERING PERSONNELL APPLARTUE NO ENGINEERING PERSONNELL APPLARTUE NO ENGINEERING PERSONNELL APPLARTUE NO ELIGIBIA PERSONNELLA P

CAP FEEDING MECHANISM.—A. JOHNSON, 16 Dunham Place, Brookiya, N. Y. This mechanism is aspecially adapted for use on bottle capping machines, and the principal object of the invention is to provide a construction whereby the caps will be fed to the capsafing mechanism in proper segmence and, in correct position.

cerrect position.

MACHINE FOR BENDING LUG STRAPS.

G. F. Ivay, Hickory, N. C. This invention provides for bending wooden log straps for picker sticks of wearing looses; and provides a method of bending wooden stilips to form log straps to avoid splitting or marring the surface of the strips.

surface of the strips.

HEMMING ATTACHMENT FOR SEWING
MACHINES.—W. MICHOSON, case of Sicessor,
Hagesseans & Go., TT Battery St., San PracHagesseans & Go., TT Battery St., San PracHagesseans & Go., TT Battery St., San Pracprovide a beauting stackment for swellar machales, arranged to persuit of accurately paslane, arranged to persuit of accurately pasing the material through the serool to Insere
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thickness portions.

VALVE—1, Marran 808 Canne Ass.

thickened portions. The cross source of other NALVE-1. J. Mayers, 366 Lenox Ave., New York, N. T. This valve or ball sock in a record, N. T. This valve or ball sock in a record, N. T. This valve or ball sock in a record of the valvy, to present a different portion of the surface of the valve, the twint data for contact with the valve seat at such operation, and to immersion of the valve seat at such operation, and to immersion of the valve seat at such operation, and to immersion of the valve seat of the valve

DESIGN FOR AN AUTOMOBILE LAMP.—
A. E. Moort, 254 W. 234 St., Manhattan,
N. Y., N. In this ornamental design for an automobile lemp, the upper and light; fa-fection part is of round construction, and is-quired on a base from galob tensor the con-



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# Cleveland Grindstones





# A Michigan Bill Counter

which is attached a bell which rings senever a count is made. Should the whenever a count is made. Should use current go through the paper for any reason—as sometimes happens in counting money fresh from the itendry which is still damp—the doors do not fit up and the bell reches to ring, and the attendant is thus warned that the bill is not count-od. She then edips it through a second time, or she can lay it saids until dry, smbettuting a dry bill. It is because of

substituting a dry bill. It is because of this dampness of the bills that the money counting machine is installed in the laun-dry room, in order to give it the most evere test possible.

But the greatest feature of this ma-

chine is not yet told. If in a plie of money there are, for instance, one dollar bills, five dollar bills and twenty dollar ones, are dount miss and twenty count bills, it is impossible to count them by "ruffling" the bills and "walking" the snears through the pile, dividing them into mentally counted sets of four or five the way piles of bills of one denomina-tion are counted by hand. Such a mixed pile must be separated into its component kinds, a separate count then being made for each kind, involving one count for

each kind, as well as a separating count. But with the Buckley counting machine, all this extra work is obvicted. The girl tending the machine simply feeds all the "ones" in the one box, the "fives" in the five box, and the "twenties" in the twenty box, and the machine counts each boxful separately and prevents her from putting more than a hundred bills in a pile without a separator between the hundreds, Should there be ones, twos, fives, tens and twenties in a pile, a machine with five counters and five magazines will do in one operation what the human counter must do in six operations!

The machine absolutely relieves the operator of mental strain. She does not count the bills, merely feeds them into the machine. An expert is able to do this the machine. An expert is able to do this at an average speed of 5,000 bills an hour, or 35,000-bills a day. A speed of 15,000 bills a day by mental counting is con-sidered highly expert work. To go faster means liability to errors and great weari-ness on the part of the operator.

With mixed niles of bills, the machine lollars where the human counting machine will count in thousands, simply cause it can do at one operation what the

cause it can do at one operation what the human counter must do in several. Mr. Buckley is now at work on a money counting machine which will be auto-matically fed, so that one attendant can count bills to the amount of a hundred thousand a day, and perhaps more. This will be on the lines of the present machine with a pneumatic pick up and feedchine with a pneumatic pick up and feed-ing mechanism on somewhat the same idea as an automatic press feeding ma-chine is constructed. This machine has not yet been completely worked out.

#### A Great Lake Passenger Steamer (Geneluded from page 512.) and the cut-off in each cylinder has a

range of from one fourth to three fourths of the stroke, adjustable from the starting platform. None of the cylinders are steam jacketed, but together with the two seam's sectioned, but together with the evo-trops task receiver their gav well immi-lated. The cetale-shaft is 15 inches in diameter in the engine bearings, 27%, instead in the engine bearing the engine in the engine bearing the engine and 71% feet long, from end to end. It weights 100%, tons. The consumer of the engine and the engine of the engine of the engine and the engine of the engine of the engine factors and the engine of the engine of the photon of the engine for engineering and photon of the engine for engineering the engineering which has been provided the engineering the engineering which has the engineering the engineering the opportunity of the engineering the engineering the which has the entry part of this planeau. The opportunity which has been predicted to the opportunity of the engineering the engineering the opportunity of the engineering the engineering the dependent of the engineering the e proped iron, with the large gadgeon bosses forged on und busines with lighten-vice. The whoels are 30 feet 3 inches in out-side diameter, such steel with 11 curved



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On this ewners' trial trip the rise. from
East Shoël to Long Point, a distance of
1881, miles, was made in his hours and
twenty minutes at an average speed of
21.04 miles per hour. On this run, one of

the safety valves blew off at 160 pounds, so it is fair to assume that under a full head of steam the "City of Detroit III." can maintain an average speed over 21 miles per hour.

# Wireless Telegraphy Without Sparks

In wireless telegraphy, electric optilia-tions created in an arrangement of con-ductors, or antenna, produce electric waves of the same period or frequency in the surrounding other, through which the waves move with the velocity of light, 300,000 kilometers per second. This length of the wave is obtained by dividing this velocity by the frequency, so that a com-mercial alternating current of 50 cycles per second would generate aerial waves 6,000 kilometers in length. It would be necessary, however, to employ an an-tenna 600 kilometers long, as it has not been found possible to construct an anbeen found possible to construct an an-tenna capable of emitting awase more than ten times longer than itself. An an-tenna having a length of 600 metera, which is about the practical limit, would emit waves 6,000 meters long, and would require an alternating current of 50,000 cycles per second.

In practice the high frequency required is obtained by the oscillatory discharge of a condenser through a spark-gap. Some inventors have devised alternators of frequencies ranging from 25,000 to 100,000 which can be connected directly with an ordinary antenna without intercalating a condenser and spark-gap, and other inventors have endeavored to construct within an area of practicable dimensi writin an area of practicable dimensions, antennae capable of emitting waves from 30 to 60 kilometers in longth, when con-nected directly with alternators of 10,000 to 5,000 cycles per second, which can already be furnished by electrical con-structors. The problem of the suppres-sion of sparks has been treated variously to rations countries. in various countries.

The American inventors. Fa Alexanderson and others, have besten all records for high frequency alternators.

Alexanderson has constructed machines of 200,000 cycles per second, a frequency corzautant cycles per second, a requency cor-responding to a wave-length of 1,500 me-ters, which is given many antennas in actual use. This machine, however, makes 20,000 resolutions per minute and makes 20,000 resolutions per minute and possesses mechanical peculiarities too audactous for practical use, from which its low sufficiency (less than 5 per cent) is alone sufficient to exclude it.

The German school appears to have limited the area covered by the antenna

the trib area of the length covered to 1 kilometer. Two solutions of the problem have been found. The Telefunken company has adopted Count Arco's alternator, which has a normal frequency of 50,000 to 60,000, and is capable of fur-nishing frequencies of 30,000 and 120,000. The power consumed is 25 kilowatts, and the power delivered is variously estimated at 2.5 and at 6 kilowatts. The con-

struction of the machine remains a secre struction of the machine remains a secret.

Rudolf Goldschmidt has constructed several machines in which the initial frequency of 12,000 is increased to 48,000 by the introduction of condensers and inductmee colls, in accordance with a princip enuciated by M. Boucherot in 1893. The efficiency is superior to that of area's nan-chine and may possibly be an great as 50 per cent.

50 per cent.

In France the problem has been treated in a revy different manner. Before attempting to construct alternations of vary high frequency it is reticute to inquire how high a frequency is flustrable. It is possible that an unshame of presidential dimensions might be an estimation of the construction of the construc



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smit very long waves and hence to permit the employment of an alternator of moderately high frequency, which would be more efficient, durable and practical than a machine of 50,000 cycles per second. As the product of the frequency by the wave-lengths is equal to the constant velocity of propagation, the diminution in frequency caused by the omission of the condenser and spark-gap can be com-pensated equally well by increasing the frequency of the alternator, the wave-

length of the antenna, or both at once.

The last mentioned expedient has been adopted by M. Bethenod, who has recent-iy devised a very successful system of wireless telegraphy without sparks.

The antenna in sheet form sugge by Blondel in 1902 already makes it nossible to produce waves about ten tim as long as one of its component wires. It has been learned, furthermore, that wavelengths of 15 to 80 kilometers, or more reach of a wireless station.

In 1905 Slaby attempted to increase

the wave-length of the antenna by introducing capacities and inductances, and made many experiments with antennæ of the sinuous type, but he was unable to arrange his coils and condensers so as to produce the desired result.

In 1908 H E Athenra of New York suggested the use of horizontal sheet an-tenna of the Blondel type, but with Slaby's sinuous or zig-zag arrangement of wires. An antenna of this sort, however, emits waves of several different lengths, which produce a confusion fatal to practical utility.

thenod's method of introducing inductances and capacities gives a wave-length about ten times greater than that of an ordinary sheet antenna carried by the same supports. The wave-length is proportional to the square root of the product of the inductance by the capacity. The difficulty of increasing the inductance and capacity of a system carried by given supports is caused by the formation of nodes at the added inductance coils, so that the wave-length corresponds to a part of the antenna instead of the whole, and consequently is not increased, but is diminished

Bethenod has discovered the law which permits the simultaneous introduction of inductances and capacities in such a manner that the wave-length is increased. rations affecting patents make it impossible at present to give drawings and calculations of the Béthenod an-

As # practical example, however, it may e stated that an antenna having a wavelength of 60 kilometers would be less than 1 kilometer long, and would require only 6 or 8 supporting pylons if it were of the Bethenod type, while it would be at least 10 kilometers long and would require 30 pylons if it were of the sheet form actually employed by the English Marconi Company and the German Tele-funken and Goldschmidt companies. For a wave-length of 6 kilometers the corresponding numbers of pylons would be 4 and 10.

In view of the facility with which thes long-wave antenne can be constructed and the increased reach obtained by using and the increased reach obtained by using long waves, it is evident that alternators of frequency greater than 10,000 are not required. A diphase alternator is prefer-able to a monophase machine. The only objection to the use of diphase alterna objection to the use of diphase alterna-tors, the necessity of employing two an-tennie, placed at right angles to each other, has been eliminated in the Beth-enod system by a device which reverses one phase before the current enters the

The new system offers several advan The new system offers several advan-tages in addition to those of simplicity and economy. In ordinary wireless tele-raphy the principal wave is attended by a train of waves of different lengths, which make accurate tuning impossible, but the make accurate tuning impossible, but the estatands waves of the new systems, absolutely uniform in length, permit visionally predict cuning and close approximation of stations without danger of interference. By means of automatic transmisters and receivers a need of 200 words

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TOR all dates prior to and industries
I Supenspie 2d, 1222 (which are undershaded according to the Old light all spins and four, diright che number of the patts are four, design quotient (1), and the spinse per of the parts are four, respecting the numerod of the patts are four, respecting the numerod the pattern of the part (2), add the number of days up to add including the given light; (3), (always counting, 26 days in Patress are; and for any flate in Jammary of February of a leap pean, take, in adding, one less than the total number of days to the given date). From take suga def (1), (2), and (3), subtract a convecting of two and divide the rewelling number, by seven. The remainder left will indicate the number of the day of the week—0 representing Saturday, 1 Sunday, 2 Monday, etc. (Note that every year evenly divisible by four was a less year under the Old Style.) under the Old Style.)



Follow the above rule for all datases after September 2d, 1752 (which are calculated according to the New Style calculate, except that instead of subtracting a correction of two before dividing by a correction of two before dividing by seven as above, subtract a correction ob-tained as follows: Take the figures de-noting hundreds in the given year and divide them by four; the difference be-tween the quotient thus obtained and the said figures is the desired correction Thus for 1905:



The change from Old Style to New Style was made by English-speaking countries in September, 1752, when eleven days were dropped from the calendar and the 3d of that month passed as the 34th Most dates previous to that time an given according to the Old Style, but some payer according to the Old Style, but cam important ones have been changed to the New Style. For instance, Washingto was really born on February 11th, 1788 according to the calendar in use at the

time.

In Catholic countries the chains, mide in 1882 by direction of Peps G only XIII, when ten days were designed from October and the St. of List and passed as the 18th. Dates of sensiti a pening in those countries between and AVER are characteristics.





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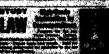
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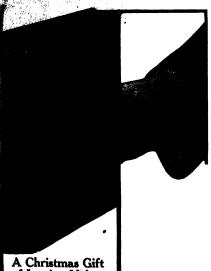


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**EDITION OF 1913** 

A. RUSSELL BOND Compiler and Editor for Part II. Scientific Informat

The editorial staff of the SCIENTIFIC AMERICAN receives annually over fifteen thousand inquiries, covering a wide range of topics—no field of human achievement or natural phenomena is neglected. The information sought for in many cases cannot be readily found in text books or works of reference. In order to supply this knowledge in concrete and usable form, two of the Editors of the SCIENTIFIC AMERICAN have, with the assistance of trained statisticians, produced a remarkable Reference Book, containing over seventy-five thousand facts, and illustrated by one thousand engravings, for which the entire world has been scoured. Immense masses of government material have been digested with painstaking care with the collaboration of government officials of the highest rank, including cabinet officers, and assisted by competent professors of world-wide reputation.

The average business man would like to know the wireless rate for passing ships, how to compute his interest, or figure his discounts without trouble. The inventor wishes to know something of the patent laws and the fundamental principles which underlie them, as well as to have access to innumerable mechanical movements which will simplify his problem. Most people are curious about the weather, but how many can name the various clouds? We are all interested in the

"Navy." but how few know the internal workings behind the walls of steel? Those who are planning a trip will find ocean rates and names of steamers, whether they are to go by the Atlantic, Pacific, or to Southern ports. Aviation, that wonderful and deady new science, is here fully treated in a chapter, written by a world authority. Under railroads, we find such precise information as the pay of a Pullman porter, the average trip or price of fare, or the lantern signals of the conductor. The Panama Canal is described with the aid of interesting graphical comparisons. Competing high buildings are shown in scale.

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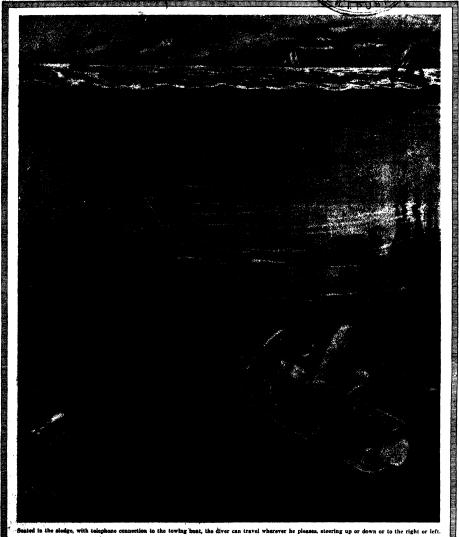
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VOLUME CVE. ]

NEW YORK, DECEMBER 21, 1912



# SCIENTIFIC AMERICAN

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Munn & Co., Inc., 361 Broadway, New York The Editor is ulways glad to receive for examination illustrated articles on subsects of timely interest. If the photographs are suitable articles with and the facts authoritie, the contributions will receive special attention. Accepted articles will be paid for at require space rules.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scien tific knowledge and industrial achievem

#### Bursting of An Army 14-inch Gun

HERE is no branch of the mechanical arts in which the materials and the processes are sub which the materials and the processes are sub-jected to more watchful scrutiny than in that of gun manufacture. Particularly is this true of the fabrication of guns of the larger callibers, such as form the principal armanment of our battleships and fortifica Conspicuous in its importance among the de partments of a gun factory is the testing laboratory, whose staff of experts keep in touch with the progress of the gun through its various stages of construction, and where specimens, cut from the gun steel are subjected to chemical and physical tests. The sy of tests begins in the stock yard, when the pig The system and general serup which are to be melted down in the open-hearth furnace, are selected with a view to giving the moiten steel the desired chemical composition, it is continued during the furnace treatment, specimeno-being taken from the bath for analysis, until the desired proportions of carbon and other constituents are obtained; and it is followed through the many process of fluid compression, hydraulic squeezing or hammer-ing, tempering, annealing and hardening, until the fluished forging is completed

Now the whole process of manufacture is closely watched by inspectors, and whenever the laboratory or other tests show that the material or workmanship is falling below the Government specifications the work is rejected. As the result of this close supervision, it is refected is all but impossible for faulty material or poor con-struction to find its way into a finished, modern gun

struction to most of large callier. Nevertheless: It is conceivable that, hidden within matter sections of the gun. one of the linked noops or other sections of the gin, there may exist some local flaw, invisible to the eye, but nevertheless constituting a memore to the safety of the gin of greater or less magnitude—a memore which can be detected only by putting the gin to the test of actual firing. It is chiefly for the purpose of giving the finished gun this final working test that such proving grounds as that of the army at Sandy Hook have been established. If any unsuspected flaw, undiscoverable to the eve, exists, or if there is any error in the calculations on which the gun has been built, it is necessary that it be developed before the gun is emplaced in a fortification. Hence every gun sent to the proving ground, where it is put through series of progressive trials commencing with small powder charges and advancing to and beyond the full charges which the gun is designed to use in service Occasionally a gun will barst under test. If this

occurs, a board of artillery experts makes a searching examination to determine the cause. If the failure he proved to be due to the design, the design is modified. The recent bursting of one of the new army 14-inch

guns at Sandy Hook should not shake the confidence of the public in the quality of guns which have been built for our fortifications, for it is an assuring fact that, although there have been minor fulfures at Sandy Hook, due to defective powder glying abnormally high pressures, the blowlay off of theech-focks the funsing of high explosive shells within the gun, etc., this is the first time that the gun liself has burst under test, during the several decides in which hooped, built up gons have been tried out at this famous proving

Big and costly though this 14-meh gun may be this mishap must be regarded after all as a routine inci-dent of the work at this post. During the past (went) years or more hundreds of guns of large caliber have sed through the ordeal which proved too much for this 11 inch piece, and until the Board of Inquiry has made its investigation and report we are justified in assuming that the defect which brought about the failure is peculiar to this particular gun, and not com-mon to all the guns of 14-inch caliber.

The 14-inch gun, which was described in our Coast Defense number of May 18th, 1912, will form the prin-cipal arm for our Panama Canal and Philippine decipal arm for our l'anama canai and l'anippine de-fenses Already three guins of this general type have been tested. The original "test" piece, a wire-wound gui, was subjected to 47.000 pounds pressure, which is far beyond the service pressure of 38,000 pounds to har beyond the series pressure of assoot points to the square inch. All these guns went through their trials satisfactorily. The gun which failed had been fired one round with a reduced charge giving 28,500 pounds chamber pressure. For the second round it was louded with 355 pounds of powder, designed to give a loaded with 350 pounds or power, designed to give a pressure of \$3,000 pounds. The men had all been sent behind the bomb-proofs, and Col. Babbitt and two other officers were in the open 250 feet from the gun, watching the target, when the gun burst. The massive fragments flew past the officers; but fortunately not one was injured.

Later, when the official report has been prepared. shall hope to give the full particulars of what promises to be one of the most interesting explosions in the history of big gun construction.

Are Inventions Ever Willfully Suppre ACK of all the agitation stirred up by Repre sentative Oldfield is the notion that corporations Bare making a business of acquiring a of inventions relating to an art and of manufacturing only one or two of them, and of suppressing the rest. During the twenty-six hearings which were recently held in Washington by the Committee on Patents to learn the views of inventors and manufacturers on the provisions of Mr Oldfield's revolutionary patent bill, sities managers, lawyers, manufacturers, and advertising managers, were asked to mention specific instances of this practice. Even the few witnesses who were in favor of the bill were unable to do so. This vague inpression, however, hung like a haze over the discussion until Mr. Thomas  $\Lambda$  Edison, with the same keen insight that revealed to him the principle of the commercial telephone, the electric light, the phonograph and nine hundred other inventions, dispelled it with an analysis that was irrefutable. Mr Edison stated:

an analysis that was 'rerefutable. Mr Edlson stated:
"I have heard and read unserous statements that many
corporations may valuable inventions to suppress them, but no
not cities specific case." I myself do not know of a stuple case.
There may be cases where a firm or corporation has bought
the state of the state of

Mr Edison ventured the opinion that the law as it exists is fundamentally sound. "What is needed," he stated, "is not the making of any changes in the fundamental principles of the law, or lessening the consideration granted to an inventor for making his invention tion granted to an inventor for making his invention publicly known, thereby discouraging and hampering the inventor, instead of giving him encouragement. This proposed new how will discourage the inventor and will benefit the very men that it now seeks to

Such seems to be the opinion of all the manufactur ers and inventors who appeared before Congress in op-position to the proposed putent legislation. And such seems to have been the more sober judgment of the last Congress, as evidenced by its determination not to press these proposals. Let us hope that if the bill is considered by the coming Congress, of which there seems to be every promise, the deliberate judgment of the entire manufacturing and inventing community, as well as of consumers and producers, will not be ignored.

#### The Status of Electric Cooking and Hot Water Supply

LECTRIC cooking appliances—the shining appliances—the shining ackel-plated or aluminium utensits, including coffee percolators, toasters, chaling dishes, each life its long connecting cord and plug for attachment with its long connecting cord and play for attachment, to the electric light socket—are especially tempting, particularly at this holiday season. The question restless: Are these articles really economical in the present strane of electrical development? Certailly electric cooking and the stillar represents an ideal. In the cooking and the hot water supply of the household the need to tage rid of fire risk, to

improve the cooking itself, and to reduce the drudgery of housework. Electric devices offer these advantag In the electric kitchen there are no matches to start n fire, there is no fire risk from the stove itself, there

ere no see leaks or explosions. In the aniest, are no gas seaso or exponence. In one queue, perfectly controlled heat of the electric oven, the j-of a joint of meat are more perfectly conserved, the meat loses less in weight than in any stove he oven. In the large electric grill of a well-known York club a thick steak, placed vertically between two incandescent walls, may be done to a turn in this teen minutes; the heat sealing the surface of the mest at once and completing the cooking with no scorching, and with no fisme to "catch" the fat as it drips down and with no fame to 'eacher' the first and a drips down into pan of water to 'eacher' the first and into pan of water the first the first and the pan of water the first the first the first and leading the elimination of all amounts or excepting of the outside of the utenal lengthens its lift and lessens the work of weathing up after meels. One may do "light housekeeping" with a toester and an erg builter on the breakfast table and a chading dish on the sideboard. But the greater safety and convenience of electric cooking devices, their superior cooking untilty, and the greater safety of electric bot water heuting cannot be fully realized at present because of the high first cost of the devices themselves, their high operating cost as compared with gas or coal stowes, and the prejudice of servants against them as against any-thing new and unfamilier. How can these obstacles thing new and unfamiliar. How can the

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As to the first cost of electric devices, it must be borne in mind that since each utensil comprises both the containing vessel and the heating element, the ever be as low as that of the ordinary kitchen utensil which it is designed to replace. A considerable ntenait which it is designed to replace. A considerable reduction in cost may logically be expected, however, with increasing demand, following the present period of exploitation of the general idea of electric cooking and improvement of the devices themselves. The cost of operation is an element of the situation in which very great improvement may be expected. Just as the introduction of the electric light was not prevented or seriously hindered by the greater cost of the new means of illumination as compared with gas, so the advantages of electric cooking may be expected to prevail notwithstanding its greater cost—provided the difference in cost is not too great. To illustrate it may pay better to toast ten slices of bread, electrically, on the breakfast table, at a cost of a cent than to make the orientast unite. It is east of a cent, that to make the same amount of toast in a slower and less interesting way on the gas slove, with the toast not so inviting or "piping hot," at a saving of a fraction of a cent. But apart from the convenience and economy of time, we may look forward to the time when in-creasing use of electric household devices will justify the electricity supply companies in reducing their rates for current—or introducing more generally the plan which already obtains in some cities, of selling current for heating and other household uses at a lower rate for heating and other household uses at a lower rate than current for lighting, each house being wired with a separate "heating circuit" with its own separate meter. The voluntary according of favorable rates will go further toward popularizing electric cooking and population was the present extensive boosting of the sale of the devices by advertising. Assuming the cost of electricity to be inwered sufficiently to take away the notion of electric cooking as a luxury, the obstacles presented by the prejudices of servants may be overcome by the fact that the intelligent house can get results by the new method and, therefore, can instruct her maid in doing so

m of domestic hot water heating is brought nearer solution by recently developed ideas of using a small but continuous flow of electric current to gen-erate heat which is accumulated or stored in the appa-ratus. The economy of this system depends on the taking of the electrical energy at those times during the twenty-four hours when the electricity supply companies can afford to deliver if at very low rates, that is in the "valley load" periods, and the success of the system requires the co-operation of the companies.

#### The Skull of Descartes

VOLUME published by the Royal Academy of Sciences of Stockholm contains an interesting Sciences or Stockholm contains an interesting and Borthellot, from 1800 to 1822. From one of these letters we learn that the body of Descartes did not reach France in its entirety. A captain of the guards cut off the head and preserved the skull, on which he placed an inscription indicating its origin. The skull was carefully preserved, and Berzelius sent it to Berth The Academy in turn came into possession of it. Mem-The Academy in turn came into possession of it. Mem-bers of the Academy examined it, compared it with a portrait, and declared it genuine, or at least appeared to accept it as such. M. Inheberalu, the librarian of the Institute, has also undertaken to establish the authenticity of this autonomical rolic. After loag in-westigations he was able to discover that the skull of Decentres had seven at one time confided to the Museum. regional tension of the confided to the Museum. It is supposed that the skull was placed in the anthropological collections, and that eventually it found its way to Sainte Genevieve. A CONTRACTOR OF THE PARTY OF TH

#### Maginowing

Mispiese Care in Faver.—The Public Service Commission has granted permission for the New York Railway to issue bends to the extent of 8640,000, the proceeds of which are to be applied to the purchase of 175 new ears of the stepless type recently described in the Runseyton America.

Lattice Masts to be Retained.—As a result of the firm instea carried out norm months are or against a lattice mast that had been exceted on the "San Marcoo," now lying on the mud in Chesapaske Bay, the Navy Department has desided to make the lattice or basket mast the standard type for funire warships. The mast, under test, showed remarkable endurance, several successful hits being necessary to bring it down.

Dissed Sagines with Electrical Reduction Gear.—The firm of Swan & Hunter are shout to build a vessel for the Canadian lake trade of between five and six thousand tons, which will be driven by two 800 horse-power Diesel engines. A novel feature will be the insertion between the segines and the propellers of an electrical transmission system, of the same type that was successfully tried out on the steamship "Electric Are."

Diminuive Dreadnenghts.—In view of the fact that our latest dreadnought, the "Pennsylvania," will displace over 30,000 tons, it is interesting to note that the Spanish are building a small dreadnought, one of three, which will be less than half ber sies, displacing only about 15,000 tons. On this displacement, however, she will carry eight 50-caliber, 12-inch guns, and 8 inches of armor and will have a speed of 19.5 knots.

Marine Engines Subject to Duty.—The act regulating Panama Canal tolls does not, as has been frequently stated of iste, permit the importation of marine engines. The circular of the Treasury Department limits the macreisals which can be imported to unfinished forgings, plates and shapes, pipes and tubes of all kinds of metal, bolts and nuts and similar things, but not to any finished or assembled machinery which forms a part of the actual construction of a vessel.

Four-mile Tunnel Through the Sellstra.—At an estimated cost of over \$11,200,000 the Canadian Pacific Railway expects within a few years to have opened a two-track tunnel, four mile in length, through the Selckir range of mountains between Calgary and Vancouver. One object of the tunnel is to eliminate the weve-threat-ening possibility of interruption from anow-sidies, which, on the present line through Rogers pass, have given a large amount of twothle. The tunnel will, of source, be operated electrically.

Question of Statues at Panama.—The suggestion has been made in the daily press that statues to Col. Goethals and Col. Go

To Depopulate the Canal Zone.—The consus of the Panama Canal Zone gives the population there to-day as 63,810, of which about 42,000 are employees of the Canal Commission, the Panama Railroad and of the various canal contractors. Generally speaking, the soil is not suitable for farming. It is not likely that Americans will be attracted; and since other occupante than Americans, for obvious reasons, are not desirable, Col Goethals is in favor of the depopulation of the zone, except so far as it will be occupied by canal operatives and by the military necessary for the protection of the canal.

Death of Alfred Pancount Bolles—We repret to the state of the American Country of the American Individual Country of the American Individual Country of the Individual Country of the Individual Country of Individu

#### Electricity

A 980-Feet Wireless Tewer.—To replace the tower of the German Wireless Company's station at Nauea, which was blown down a year ago, a new tower 917 feet high is being erected. It is expected to have a radius of 6,000 miles.

Show on High-tension Transmission Lines.—In an article attacking the German requirements regarding serial transmission lines, which hold that the accumulation of snow on the lines is proportional to the dameter of the wires, Dr. Maguene states that mow news colects on lines carrying 100,000 volts or more, even when they are not charged and are cold. This he attributes to electrostatic action.

New Leadless Storage Battery.—A Swedish inventor has put on the English market a new type of alkaline storage cell. The plates consist of inactive retainers which are loaded with active material, oxyhydrate of nickel mixed with graphite in the postives and finely divided alloy of iron and cadmum and certain other substances in the negatives. This new cell much resembles the Edison cell not only in the electrochemical reaction employed but in the fact that extreme ingenuity is employed in the mechanical construction to obtain high space and weight efficiency and durability.

A Coppered Incandescent Bulb.—A big tungston bulb in a store window andeauly hurned out and passers, but the state of division and the particles adhere very well.

A Speaking Incandescent Lamp.—The invandescent lamp is not the mute electrical apparatus that we have always supposed it to be. It has just been discovered that given the right conditions it may be made to speak as resulty as the arc, which for the last afficer was resulty as the arc, which for the last afficer was a monopolized this accomplishment. According to Physical Related Lexischerify, Messers. K. Ort and J. Ridger have used a metal filament lamp as a telephone receiver. An lorsm lamp of 100 candle-power is employed. The lamp is placed in a 120-volt direct-current circuit moduling a self-induction coil. Shunted across the two terminals of the lamp are a capacity and the secondary of a telephone transformer, the primary of which connects with a battery of five storage cells and a powerful microphone. Words spoken before the merophone are reproduced in the lamp. The discoverers of the speaking incandescent lamp explain the action on the primople that the telephonic current variations superposed on the ourrent that passes through the lamp produce corresponding variations of heat in the filament, which relating to the glass of the bulb, cause the latter to expand and contract proportionately and thus transmit the vibrations to the exterior sir. This effort cannot be produced with 16 or 32 candle-power lamps because the glass in the theat variations too feable the states its out-field and the plans in the theat variations too feable the glass in the theat variations too feable.

Peace Between the Marconl and Talefunken Companies.—It is gratifying that the petent ittagetion which has for several years been pending between the two largast concerns in the field of wireless tolegraphy. Mears. Marconl Company in England and the German Telefunken Company, should, at last, have come to an end. It will be remembered that the two companies charged one another with interfering with their respective patent rights and contested the validity of their patents. There are no less than seven lawuits of this kind pending in different countries. Now the Telefunken Company, what the agreement of the Marconi Company, has published in Germany the following statement. "Mears. Marconi Company and the German Telefunken Company have agreed to cancel any patent iliquation pending between themselves in different countries. The Marconi Company forego any intention of contesting the validity of such Telefunken patents as have been soknowledged by German courts, e.g., the Braun patents." Mesers. Marconi Company, with the agreement of the German Telefunken Company, has published in England the following statement: "Mesers. Biemens Brox. & Co., Ltd., who in England represent the interest of the German Company, has published in England the following statements." ("Mesers. Biemens Brox. & Co., Ltd., who in England represent the interest of the German Company, has published in England the following statements We. 777 of 1900, arrangements being made for stilling any mustale patent ittigation pending between the two companies."

#### Automobile

New York's Shows.—The annual automobile shows in New York city will take place in January, on the following dates 2nd to 11th, show of imported cars in the ballroom of the Hotel Astor; 11th to 25th, double show of domestic cars in Madison Square Garden and the Grand Central Palace.

Ghent to Have a Six Months' Automobile Show.—In connection with the great international industrial exhibition which will be held in Chent next year, and which will remain open for ax months, the Belgian Motor Union will organize a collective exhibit of automobiles, motorcycles and aerosylane.

Motobuses Need Many Tickots.—The extent of Lonor's motorius traffic will be appresented when one hears that no less than 20% tons of pulp are required to manufacture the teletes for one year's rides. It would be intensing to know how much the New York Steway consumes, because sulways telects, while much smaller, are much thicker than London bus telects

Ventilating the Dash Hood of an Automobile.—George Wonkins of Dortroit has patented, No. 1,945,776, a remiliator which consists of a curved deflector embracing the upper edge of the dash hood of an automobile and suitably spaced with portions on both the timer and outer sides of the hood so that the air current induced by the motion of the ear will be deflected from the outside of the hood to the inner sade thereof to ventilate and soot the portion of the ear immediately in reast of the hood.

Henery Establishes New World's Records—Vision Henery, whose thrilling driving in American road races of the past four years is still remembered on this sade of the Atlantic, on November 27th broke the world's record for ax hours' continuous driving at the Brooklands track in England. At the wheel of a 60 horse-power Lorranze-betrieh he overed 518 miles in the period at a sustained speed of 80½ miles per hour. The former record was 461 miles in six hours.

Segregating Show Care According to Price.—Because the cheap and medium-proved eur naturally suffers somewhat in comparison with very high-priced cars, especially when placed alongside of the expensive product, it has been suggested to divide automobile exhibits in the future seconding to price of cars, keeping the cheapset in one section, medium-proved in a second section and high-proved machines in a third section. Three separate buildings would be still better.

Heve a Lost Motor Wes Found.—An unusual story of inding lost property comes from England. A repair shop received by express an automobile motor which was to be repaired, but the package contained no mumation of who the sender might have been I no nee of the cylinders an old copy of a British motor journal was found and the repairman promptly concluded that the owner of the motor was a reader of that paper. The story was sent to the paper and the owner got his motor back.

Would Charge \$25 Admission to Automobile Show.—
It has been suggested to charge an admission fee of \$25 on a certain day of the next automobile show to be had at Olympia, London. The great crowds which throug the architition halls make timpossible for the untending purchaser to examine the ears closely and to get adequate information from the attendant On the purchase of a car on the floor of the exhibition, the admission fee would be refunded Loners under such an arrangement would naturally be the accessory dealers who cannot get along without crowds

British War Office Wants Motor Trucks.—The requisitions for the tests which must be undergone by motor trucks submitted to the British War Department have trucks submitted to the British War Department have presented by the British War Department have of parts took place in August last, and only two types of parts took place in August last, and only two types of trucks succeeded in passing them. A new subskilly trial has been amounced for February next, when motor truck manufacturers may submit their vehicles to the War Department's senting A in the case of France, Germany, Russas and Austras, motor trucks which pass the test will be subsishized.

Taxicabe Need Not Drive in Fog.—That a taxicabe need not be driven in a typeal Landon fog, and that the would-be passenger, after being taken for part of the agried distance, must pay for the mileage covered, is the decision of a London paster. As the story comes from England, it cost, the motorist II shillings and 8 pence to find it out, while the original taxenab hill had only been I shilling and 2 pence. A taxical driver had been engaged to drive from S. James' to St., John's Wood, but at Clarence Gate the fog was so dense that the driver could not see the hood of the motor. He stopped and refused to drive any farther, claiming it to be too dangerous. The taximeter registered I shilling 2 pence, and the passenger refused to pay. The matter was carried to court with the result that the "taxi" was complimented by the judge on his good sense and the passenger ordered to pay the fare and coats.

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#### The Death of Prof. Sir George H. Darwin

DROF, SIR GEORGE H. DARWIN, M.A., F.R.S. P. Li.D., D.Sc., who died recently, was the second son of Charles Darwin, the great naturalist. The Darwin family for generations has included men distinguished ramny for generations has included men distinguished in the arts and sciences; and while the originator of the Darwinian theory, one of the most eminent investi-gators and thinkers England has ever produced, un-questionably overshadowed the others, it has not been through his reflected glory that his sons took their de-servedly prominent position in the world of science.

Sir George H. Darwin was born at Down, in Kent, Sir George H. Darwin was born at Down, in Kent, Ingidand, in 1945. He was educated under the Rev. Charles Pritchard, who subsequently became a Fellow of the Royal Rociety, and the Savilian Professor of Astronomy at Oxford. In 1864 George Darwin enter Trinty College, Cambridge, from which he was grad-uated in 1864 as Necond Wrangler and Smith's Prince matt. From 1868 to 1878 he was a Fellow of Timity muin. From 1868 to 1878 he was a Fellow of Trimity College, and was re-elected in 1884. He studied law, and was admitted to the bar in 1874, but he did not subsequently practice that profession. In the following year he returned to Cambridge, and

devoted his entire time to the study of the mathe-matical and astronomical sciences, and particularly to experimental investigations on the pressure of loose sands, on changes in the level of the earth's surfaces, and on minor earthquakes. His interest in astronomical and meteorological studies and investigations had been aroused prior to this, and in 1870-71 he accompanied the English expedition to Sicily to observe the panded the English expedition to Sicily to observe the settiese which occurred during that period. In 1882 Prof. Darwin assisted Sir William Thomson (Lord Kelvin) in the preparation of a new edition of Thom-son's and Tati's "Natural Philosophy," and in the fol-lowing year was applied Plumian professor of as-tronousy and experimental philosophy at Cambridge, succeeding the Rev. James Challis. M.A., F.R.N., to a chair which Prof. Darwin held with distinguished success. From 1885 to 1995 he was a member of the Council of the Meteorological Office of Great Britain. Council of the Meteorological Office of Great Britain Council of the Meteorological Omee of Great Britain, and he served on the Meteorological Committee of 1905. He was chosen a member and later, in 1879, a Fellow of the Hoyal Society. He was a preeddent of the Britlah Association for the Advancement of Science, and as the head of that association, he formally opened the Victoria Falls Bridge over the Zambest Gorge in Central Africa in September of last year. In 1885 he received 'a royal medal" from the society for his scientific work, and also one from the Royal Astronomical Society.

Prof. Darwin was an honorary graduate of the universities of Glasgow, Dublin, and Padua, as well as a member of several British and foreign academies of

Prof. Darwin's published contributions to scientific literature include papers on consunguineous marriages, for the Statistical Society; jointly with his brother on Small Deflections of the Plum Line Due to Movement of the Earth, British Association Report; a series of reports to the British Association on Harmonic Analysis of Tidal Observations, 1883 and later; several pa-pers on the same subject in the Proceedings of the Royal Society; a series of memoirs on the Effects of Tidal Friction on the Earth and on the Moon, Philosophical Transactions of the Royal Society; papers on subjects cognute to the last, and on Figures of Equi-librium of Rotating Masses of Fluid and on the Menormal of Rounding sussess of Find and on the Me-chanical Constitution of a Swarm of Meteorites, Phil-osophical Transactions of the Royal Society; a paper on Periodic Orbits, in 1896; and one on the Tides and Kindred Phenomena in the Solar System, 1898.

#### To Our Subscribers

WE are at the close of another year—the sixty-VV eighth of the Scientific American's life. Since the subscription of many a subscriber expires, it will not be amber to call attention to the fact that the not be subset to can irrearion to the ract that the sending of the paper will be discontinued if the sub-scription be not renewed. In order to avoid any in-terruption in the receipt of the paper, subscriptions should be renewed before the publication of the first issue of the new year

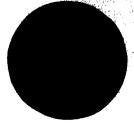
To those who are not familiar with the SCIENTIFIC AMERICAN SUPPLEMENT A WORD may not be out of place.
The Scientific American Supplement contains articles too long for insertion in the Scientific American, as well as translations from foreign periodicals, the in-formation contained in which would otherwise be innecessible. By taking the Scientific American and Supplement the subscriber receives the benefit of a reduction in the subscription price.

#### Removing Acid Stains from Instruments

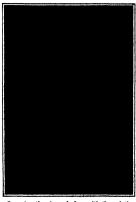
GOOD method of removing acid stains from labora-AGOOD method of removing acid stains from labora-tory instruments is to rub with pearl ash and then boil for a few minutes in soap water. The instruments should then be dried in magnesia powder and polished with a dry cloth.

# Capturing Prost Flowers

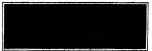
By S. Lectord Smalls.
HERE must be few people who have not set the exquisite patterns which Fack Proof.



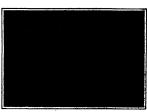
A captured frost pattern in gelatin.



Smearing the piece of glass with the gelatin



The glass should be supported on a cup placed out of doors in freezing weather,



Flooding the plate with absolute alcohol when the frost flowers are well developed.



A captured frost flower.

If a great pair the distribut parameter actus. It is all a so able to bring forward a sea

A comme

on this for bring forward is similar to write the transfer heating records of the 100 feet in a similar to the records of the 100 feet in a similar that majore out unity 2. An house of excess, each in Sin way provide the relationship to the without the similar to the similar than t the druggist to make up for you a soundom-set two pairs cannot clear point dissorted in distributed without "Also secure a small quantity of absolute absolute, a few ounces will be all nufficient for the physpons. It is, spall to get all these things ready in advance, briggs, says attempt is made to teste secords of the front flowers. At a time when there are at any tone several flowers. At a time when there are at any tone several significant proper of frost out of doors, we may make just just bright stell at spanning the loss patterns. It is, of course, subjec-tion of the pattern solving, the spirit, and the plates of clear glass, are to hand. If the weather is could that they then the scalarin will be in a newfathy

cold it is likely that the golatin will be in a partially solidified condition, and in order to make it ready for use it may be necessary to place the bottle in a bowl of warm water for a few moments. When the mixture to warm water for a row moment. When he smeared over a sheet of glass. This is perhaps best accomplished with a good dised break. In any case it is important that the solution should be sureed over evenly, and be quite free from air bubbles.

The best results are secured when the freezing rocess is as rapid as possible, and it is desirable to support the glass so that it will be in a very exposed position. To bring this about a good plan is to reather glass on an inverted cup in the manner indicate in the accompanying illustration. Even in a compara-tively slight frost, if the glass is placed in this way, a few inches above the level of the ground, the chilling influences of the air will speedily begin to make then

It is well to watch rather closely the action of the frost on the gelatin solution. The freezing process should not be arrested until the pretty flowers are well should, also be arreaded until the pretty nowers are well developed, although on the other hand if the action is allowed to continue for very long, the pattern will become too involved for the best effect. When it is considered that the design is at its best, the glass may be taken into a cool room for further treatment. delay is permissible, as the pattern will, of course,

rapidly fade away in a warm atmosphere.

Place the glass in some kind of a dish and immediately flood the plate with the alcohol. For about two minutes rock the dish backward and forward, so aseto insure that every part comes under the influence of the spirit. Eventually it will be found that the alcohol the spirit. Eventually it will be found that the alcohol will have entirely removed the ice, leaving behind a permanent formation of the gelatin which may, without difficutly, be preserved for an indefinite period. The best way in which to protect the gelatin, which otherwise would be likely to be affected by atmospheric moisture, is to cover it with a film of clear varuish. This should be applied with a good deal of care in order that the beautiful ice flowers may not be dis-

The best results will be obtained if a number of at-tempts to secure the patterns are made. Thus the sheet of glass may be put out of doors, and if the re-sulting pattern is not very good, the geletin solution should be cleaned off and another trial be made. In this way we may be quite certain of getting some very face pictures. By a few experiments of this nature it will be easy to discover how far the freezing p should be allowed to go.

Of course these captured frost flowers will make the most beautiful transparencies, and as such may be used in the form of window ornaments. Apart from ties kney side the idea has a useful object, as large pieces of glass which could be used for putting in win-dows may be those with real ice patterns. Wheever an undertrable view needs blocking out the result is at once useful and highly decorative. If liked, the effect once useful and highly decorative. If liked, the effect can be very much enhanced by coloring the gelatin in some bright tint. For this purpose any antiline dry in very useful, the substance being mixed with the gelatin before this is placed on the glass. Most of the brighter colored links which are commonly sold are practically solitations of aniline coloring, and as such may be used with effect for this particular purpose.

Welker Johnson on October Sint broke the American saropishoe cadurance record for a light with one pea-senger. He flow a Thomas Diplane, and remarked in the sir 3 hours, 51 minutes and 12 seconds, covering a distrince of 255 miles. The source lay between Serious age of Bath, New York. The average was about 650 feet.

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Pig. 1.—With the Bélin apparatus it is possible to transmit photographs over a telephone line to a distant receiving station.

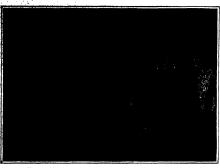


Fig. 2.—The receiving apparatus. A, is the oscillograph; B, is the photographic frame in which the receiving cylinder is held; C, is a lens combined with which is a series of screens; M, is an electric motor that drives the apparatus.



Fig. 3.—A portrait transmitted by the improved Bélin telephotographic apparatus in four minutes over a telephone line of 450 miles.

# Sending Photographs Over a Telephone Wire

The Improved Belin Apparatus

By Jacques Boyer

A FRENCH physicist, M. Edouard Bélin, whose remarkable work in telephotography was described in the Schevitic American of December 21st, 1907, and June 12th, 1909, has invested a potrable telephotographic apparatus. The new apparatus, remarkable

graphic apparatus. The new apparatus, for its small size and weight, constitutes a complete trunsmitting station, which can be connected up with a convenient telephone line in order to transmit pictures to a distant receiver.

In the so-called carbon process of photography, invented by Poliverin, photographic positives are made on paper cested with sensitive bichromated geletin, which, as every one knows, becomes insoluble when exposed to light. When the print is taken from the printing frame, it is washed in hot water, the gelatin dissolving more or less, according to the variations in opacity in the negative. As a result the positive obtained consists of reliefs and depressions corresponding respectively with the whites and blacks of the original negative. The halftones lie intermediate between the maximum elevations and depressions.

The bichromate gelatin proof thus obtained is wrapped around the cylinder A

The bichromate gelatin proof thus obtained is wrapped around the cylinder A of the portable telephotographic apparatus (Fig. 4), which is rotated by a powerful spring motor in the drum B. The spring, which can be wound up by means of a crank visible in the photograph, also drives through multiplying gears a governor B, the purpose of which is to maintain the speed of the cylinder's rotation at a constant number of revolutions. The cylinder's speed is size controlled by means of the graduated index immediately behind the pane of glass at the front of the apparatus. A milliansprer-meter M is mounted to the left of the apparatus.

As the cylinder A rotates, a rheomicrophone O is made to travel parallel with it by means of a screw, the principle being much the same as that embetted in the Edison phonograph. The rheomicrophone O consists of a frame, box-like in form, the bottom of which consists of an insulated plate, and the cover of which is a feetible conducting sheet of carbon, serving the purpose of translating the variations in relief on the cylinder into currents of different intensity in the line. Do carry out this purpose resistances conveniently divided take the stages are arranged on the insulting laples. The currents from a small hattery is received by the feet relations, always in constant with the confincting that, said fines, show the confincting that, said fines, down the confincting that were attention?

resistance. Depending upon the amount of pressure to which it is subjected, which pressure is governed by the hollows and elegations of the bichromated gelatin, the conducting plate beads more or less and inuches a variable number of resistances, the number increas-



Fig. 4.—The improved Edia telephotographic apparatus. A is the cylinder on which the original picture is wrapped; B is a drum inclosing a spring which drives the cylinder; C is a rheomicrophone; R is a governor that controls the speed of the cylinder.



Fig. 5.—The receiving agiliader of the Bélin apparatus. The casing has been

ing with the impulsive force received. Hence currents of successively different intensities are sent through the line. Microphonic contacts are employed in order to obtain better results in the transmission of photographs. It would require entirely too much space to describe in detail all the elements of this

describe in detail all the elements of this portable telephotographic apparatus. It may be stated, however, that perfect synchronism is obtained between the transmitting and receiving cylinders. For the purposes of this article we must proceed to a description of the manner in which the apparatus is utilized.

After the golutin bichromate print, has been wrapped around the cylinder, it is merely necessary to connect the apparatus with a telephone line. At the receiving station the telephone wires are connected with a large Rélin telephotographic apparatus, on the cylinder of which sensitized paper is wrapped on which sensitized paper is wrapped on which the picture is to be received. The paper is protected by a kind of hexagonal histographic frame.

photographic frame.

All is now ready for the transmission of the photograph. The operators first exchange the necessary signals and synchronize their respective cylinders. The transmission of the photograph does not in any way interfere with the regular use of the telephone time.

At the receiving station a Nerrot tamp is employed as a imminor source. Its rups are projected on the sensitive surface, which is to receive the pletture, by means of a Blondel oscillograph. The oscillograph consists of two large colis between which a mirror oscillates. The movements of the mirror are proportional to the intensity of the currents received. The pencil of rays emitted by the Nernat lamp is reflected in a little mirror; then the rays pass through a small aplanetic leas G, in connection with which the inventor mean series of graduated screens that enable him to pass from complete transparency to complete obscurity. The receiving cytinder, which is identical in size with that of the transpariting station (Fig. 5), is driven by an electric motor M, mounted beneath the table on which most of the apparatus is carried. The motor is very carefully synchronized with that of the transparitor by means of a special rheaviant. The cylinder of the receiver, indicated by B, in Fig. 2, and shown in detail in Fig. 5, is mounted in a wooden cusing. This cashing has a circular opening one third of a millimeter in dameter, through which the luminous rays enter. The walls of the casing are

(Concluded on page 343)

# The Pier Problem at the Port of New York

#### How Manhattan Has Encrosched on the Hudson River

IT is probable that few people outside of the historian and the Dock Commissioners have any conception of the great extent to which the bulkhead line of New York city has encroached upon the Hudson and East They will be surprised to learn that since the 1626, when the West India Company purchased year 1626, when the West than the ladians for sixty guilders,

manactan island from the lanna a sum equal to about twenty-four dollars at the present day, the shore line below Chambers Street has been gradually pushed out by has been graculary pushed out by bulkheading and filing in, until the area of the island below Cham-bers Street is approximately 75 per cent greater than it was some three hundred years ago.

At the present time, when the question of bulkbead and pierhead lines along the Manhattan shore fronting on the Hudson River has come up for another and probably its final determination, particular interest attaches to the accompanying map, which shows, by a shaded line, the original shore-line of Manhattan and Jersey City, or rather the shoroline as determined by a survey made at about the time of the Revolution. and also the location of the present bulkheads and pierhead lines, and the proposed modification of the pierhead lines which is suggested by the city authorities and the Governor of the State, and for which Federal sauction is now being sought in a bill before the House presented by the Governor-elect William Sulzer.

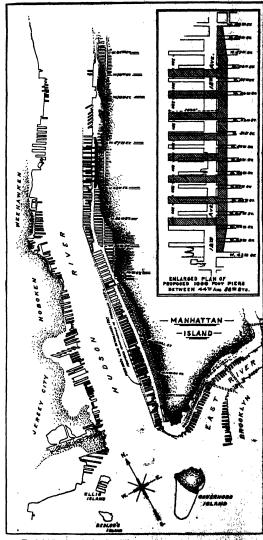
The original shoreline as shown on our map is approximately that was established by nature, with the exception perhaps of some slight encroachments which took place at the lower end of the island in the days of the original ew Amsterdam. The ter adjoining the highwater line was more or less shoal, the un-derwater profile of the bottom of river sloping more or less ually to deep water; and the motive for encroachment upon the river and bay during the past 300 years has been the same-the deyears has been the same—the de-sire to provide deep water and pler accommodations for ship-ping. Moreover, as far back as the seventeenth century, it was realized that the rapid currents of the Hudson and East rivers had to be guarded against, and as early as 1654 it was resolved to drive planks into the shore to make uniform "sheet piles" between Broad Street and City Hall, for the lower part of the city. Several ordinances bearing on the subject of the water front were ed, but the net in 1654 was the first formal attempt to con-struct a statutory bulkhead. Another motive for the encroachment was the natural desire to increase the area of Manhattan Island. To an extent this has been achieved a cursory glance at the accompanying map will show. The bulkhead line along the

Hudson River was established by statute in 1871, 1897 and 1994, this last relocation being made be-tween West Twelfth and West Nincteenth streets to accommo-date the new Chelsen plers. The pierhead line was first established by statute in 1857. There was a revision in 1890, and the present line was established in 1897. The have been carried farther farther out into the river, to accommodate the ever-increasing

growth of steamskips. Just how large this encreases ment has been will be understood, when it is estable that the present pierbend line between Flex 1 and Fifty-minth Street is from 1,000 to easily 2,000 fiet begind the original shoreline of Manhattan, this last figure obtaining in the neighborhood of Wenety-nicht Street, where the original shore line lies fully 1,500 feet in-

ships of an the less is the co-

There are two ways in by a yet farth the pierhead line into the the other by maintaining the tent pierhead line and exce-back into the shore. I boards have been appoin look into the question. The B of Estimate has approved tw the plans suggested; or ate and pressing needs of future, while the make provision for the next two or three Both of these plans as Both of these plans are upon the map which is he nublished. The first pla published. The first plan, meeting the immediate situa calls for a straightening of pierhead lines between the tery and Thirtieth Street; a: cation which would make it sible to build between these po some twenty piers, varyi length from 920 to 1,040 fee present bulkhead line curves and the running of a straight pier-head line would not narrow the fairway of the Hudson River below the minimum width, which accurs opposite Castle Point on the curs opposite Castle Point on the Jersey shore. The other scheme approved by the Board of Esti-mate calls for the construction, as they are needed, of piers of from 1,000 to 1,200 feet in length be-tween Forty-fourth and Fifty-sixth streets, the necessary depth. to be obtained by excavating in SCIENTIFIC AMERICAN that it would be a wise provision for the city to purchase the whole of the blocks lying between Twelfth fourth and Fifty-sixth str This would provide accommation for piers of 1,500 feet les shipping call for the from Fifty-ninth to



CLASS CONTRACTOR OF A STATE OF A common be evaluated, but the names of initial be withheld when so desired.]

#### The Flight of Projectiles

The Flight of Pajactiles
The de Mitter of the formation Assessors:
The delication in sciole on the flatte of projection.
The delication in sciole on the flatte of projection,
The Activated Urainia, a province of the comparison of
the spike of a least-half to the twist of a bullet, on the
ground that is hear-half to the twist of a bullet, on the
ground that is hear-half at rotated on an axis more one at right angles to its imjectory, wherea

gradie is rectated on an atom processing specific is requester;

If a projective, who exists an would be sound, but it is inspectory, the critisium would be sound, but it is installed a sight departure from this condition that emisses the drift. The moment the projectile leaves the gran, the force of gravity begins to pull it away from the path of the axis of its rotation, and this slight departure is enough to make the analogy of the beautile and applicable.

Limit Limit, while Instructor of Ordnance

hall applicable.
The late Major Lissak, while Instructor of Ordnance at West Peint, showed me an apparatus he had converted to Binterate the defix of a projectible in flight. He had a sphereconical shell mounted in gimbals, so that it could be rotated rapidly and was free to turn in any direction. The resistance of the air to the format liberal and the simulated by a hose from a compressed-air hank. Upon directing an air current directly at the point of the shell, to intuite the resistance due to the point of the shell, to intuite the resistance due to the fall of the point of the shell intuite the resistance due to the fall of the projectific from the prolongation of the sade of the gar, the point of the shell inmediately sumed to the right. Upon directing the air from this queries to inslints the resistance for the same with a sessued to demonstrate that the same resistance which caused the drift, further operated to make the projectific follow its point.

Sincur Balzot. follow its pole

Washington, D. C.

#### The Self-contained Diving Outfit

To the Editor of the Scientific Assurcan:

In your issue of the 5th of October there appeared a notice of a self-contained diving outsit. From the description, the lay-reader would infer that he idea was a new one; this, however, is not the ones. There is shown new one; this, however, is not the case. There is about itsely nothing novel in the device as described, as you will see on referring to pages 25 and 29 of our catalogue, which we have been seen that the contraction of the illustrations in our catalogue, which was published three years ago, with that which appeared in your journal will show you the similarity. And further to emphasize the lack of nevel; in the amount is basize the lack of novelty in the apparatus in to emphasize the lack of novelty in the apparatus in question, we would mention that we introduced the first apparatus on this principle nearly thirty-four years ago. Used by one of our diverse to long ago as the year 1890, it was instrumental in saving the flooded Severn tunnel (rick report herewith). See page 172 of "Diving Man-ual." which we also send you. Knowing the reputation of your valuable journal, we

Knowing the reputation of your valuable journal, we less sure that you will give publicity to our estament, and so remove any false impression that may have been formed in the minds of your reader. Just as our Plenes self-contained breathing appearants for use in trengtessle atmospheses, introduced by us tairty-dry sears ago, was the first practicable appearants of the class using compressed corygen and estatic poisable avertifying agents, so our original Falses diving appearants (much improved in recent years) must be regarded as the prototype of self-contained diving centific.

otype or sen-consussed cross; Country & Co., Led.
Summy, Consum & Co., Led.
London, England.
R. W. Davus, Dissector!
The catalogue and manual have been received and ser-out the constantions of our correspondent.—Birrion.

#### How Would You Convense With Mars?

How World You Coursense With Mars? To the Ridisor of the Scutterage Assentance; Suppose that it had been once and for all determined that Mars is inhabited; chief signal Spains sent from other the Rest or Mars had been arrived by corresponding Substan. How would be because the contraction of the Such to commission onde without would make the timelecture of Mars or the Such to commission with the possible to formulate a radio without would make the timelecture of Mars of the other world, and had been compared to the formulation of the same case throughing of one owney, which we have to be the same case throughout of the county political particular to find the same cases throughout of our court political particular formula affairs. To the survey will to east signal findings Weeping the paint with making we care upon the significance of the findings. Now well we own to able to such a survey of the same of th

understand geometry and to recognise the characteris-tic diagrams of well-known geometric theorem. Thus, within saids all iscanding difficulties, suppose we covered a considerable portion of the earth with a huge diagram at would illustrate the theorem: The square on the etanues of a right-angle triangle is equal to the sum of the ares on the other (no sides. The Martians might reply squaries on the oner (or eace. The martians might reply additioning to us a diagram that would illustrate another theorem in Buelld, thereby showing that they understeed at least the principles of Evolid.

Even with this beginning I find it difficult to imagine

uncommon as sear use principles or Eucoid.

Even with this beginning I find it difficult to imagine
the next step. Perhaps some of the readers of the Scien-rities Assunces may be able to suggest methods whereby
the President of a Martian republic could relicitate the
President of the United States on the three hundredth niversary of the signing of the Declaration of Inde-

New York, N. Y.

#### Sanitary Horse Troughs

To the Editor of the Scientific American: It has been found that the horse trough has proven a prolific means of carrying infection. Hundreds of horses have taken glanders and all sorts of things we that means. Not that the horses touch the iron part of the means. Not that the horses touch the iron part of the trough and leave germs there, but simply that a healthy horse drinks immediately after a diseased one and gets the germs, spume, etc., left in the water by the other. The tides suggests itself that the horse be given a hygical drinking fountain, as is provided for us humans. We can't expect a horse to put his mouth over a little stream shooting in the air, but the device that is roughly sketched shooting in the sir, but the device that is roughly sketched heem will do the trick of giving the horse an individual dralating fountain. A is a drinking fount of sufficient size to hold a normal drink for a horse, and set high or low as desmed best for checked or unchecked horses. It is set upon a resandard? Other serves as a waste pipe. Inside of this is a supply pipe E and a stopped rod F. Hil are performed drains around a fountain to carry off the water perforated drains around a fountain to carry on one that is slopped over, and D is a little dogfount that simply catches the waste from the overflow above. At some



Sanitary fountain for horses.

ar the fountain, where a horse has to place his nt feet in order to drink from the fountain, would be a platform device J, not unlike a scale platform. Normally, the stopper C is in position D and the fount is dry. By a the slopper C as in position S and me fount a my say a simple system of levers, etc., when a horse approaches to drink he is bound to get his front feet on J (that yields sufficiently to operate the mechanism, but not enough to bother or feas a horse) which closes down stopper C and opens the valve in E, and as long as he stands there that valve is open and the water is running. When he leaves that position the water is closed off, the stopper rises, and the fount is empty of any residue water. Each horse gets the tolunt is empty or any resource water. Each norse gets a drink of fresh, clean water and the tank is flushed after every drink. The saving of water over the continuous running tank is also an item in its favor. Plus which, it is an anti-freesing fountain. The water valve can be, as in ost hydrauts, well below freezing and a self-drainer; re being no water left in the tank, it is a fount th can be kept in operation all winter. And it would be a simple enough matter to so protest J that that mechanism wouldn't necessarily fill with water and freeze. And it would be a

Washington, D. C. F. W. FITSPATRICK.

#### How are Trees Splintered by Lightning?

To the Editor of the SCIENTIFIC AMBRICAN:

to the senior of the Scientific Ambitican: In your issue of August 3rd, 1912, under the heading of foreignandings I noticed a letter from Mr. Austin P. Wolfsie, smithed "A Notable Lightning Stroke," the scient which interests me is in his soutence: "The splin-

point which interests me is in his sentence: "The splin-tering of the unremous pine tree could well be accounted by the interest pine tree could well be accounted by the speed in connection with the air in the tissue cased by the sudden heating by the current."

New 1 last's petualty writeseed the striking by light-ming of air. This particular wood, as in the period of the period of the period of the period and the by the period of the period of the period and the by the period of the period of the period of the well known; if one of the soundest and heateds in the well known; if one of the soundest and heated in the well known; these free way to beat it into hundreds of please, the impact weighing no more than ten pounds, from the formest branch to within eight feet of the greened. It was a tree 70 or 80 lees in height, and the

pieces were thrown in every direction, some as far as 160

preces were unrown in every direction, some as far as 100 yards from the base of the tree.

A dead and seasoned "iron-bark" has no sap, and as there was no rain, it being a dry storm, the theory sudden development of steam would not account for the blasting.

on, again, the amount of heat ne the air in the tissues of the tree would have to be terrific. and there was not the slightest sign of burning or scorehing. On the other hand, I have seen lightning strike a and simply ignite it without blasting it into

Thus it is reasonable to suppose that Mr. Nichols's statement will not explain my example. I have never heard a satisfactory explanation of the case. Is there one?

T. KINGSMILL ABBOTT.

Murralla, Wingen, New South Wales.

#### Free Will Versus Determinism

To the Editor of the SCIENTIFIC AMERICAN

I wish to refer briefly to the letter of J. L. Stinson in your issue of October 12th. His observations had for their text the quotation from Dr. Johnson: "All theory is against the freedom of the will, and all experience is

While the statement that all theory is against the Freedom of the Will is decidedly untrue, the second part of the quotation, if reasonably interpreted, must remain an irrefragable proof for Free Will against the arguments an irrotraganic proof for Free will against the arguments of the Doterminists. Nor can any setentific or philosophic mind accept the pseudo-parallel argument about the rotation of the sun around the earth, proposed by Mr. Stinson, as disproving the legitimacy of Dr. Johnson's conclusion from experience.

conclusion from experience.

The experience which forces a reasonable man to con-plude that he has a Free Will is immediately connected with his inner consciousness. And in purely deliberate actions, such as that of mental attention in recalling the incidents of a past experience or in considering the mo-tives for and against a certain line of action, the evidence for freedom in guiding the mind's activity is so powerful for frection in guiding the mind's activity is so powerful that no one can resust it without montal violence. Any-one can perform an experiment of this kind. The process is so simple and clear of detail, that confusion of experi-ence with inference is impossible. On the other hand, to deny that consciousness is a reliable witness for truth

ould clearly make all scientific knowledge impossible.

The so-called experience for the sun's revolution is so indirectly and remotely related to consciousness and so arrelevant to the plan of argument that nothing further need be said about it.

edom of Will in man is by no means unthinkable, except for those who assume, without warrant, that the theory of materialistic Monism is a proven fact. A priori conclusions from unestablished premises are any-thing but scientific. Ardent pursuers of this method are rmly unfair to opponents and uncanded in their use of oviden

It is unfair to say that the advocates of Free Will would It is unfair to say that the advocates of Free Will would make man's actions motiveless. The very opposite is true They hold that the Will of man is a rational appotency, and simply cannot act without a motive under some aspect of good. They deny, however, that any motive of finite goodness necessarily compels the will to act. No matter how preponderant the algebraic will to act. No matter now preponderant the agenral resultant of motives, measured in terms of pleasure or here-and-now advantage, may be for a certain inte of action, the Will may hold out against consent at the expense of great pain. No one could seriously maintain, expense of great pain No one could seriously maintain, against the clear testunony of his consciousness in such against the clear testinony of his conscousness in such cases, that he would not be perfectly free to follow the casier course of action It is possible and safe to predict how the average man will act under set conditions, because, first, as a matter of

fact, very many of man's outward actions are indeliber-ate, and so are only the response to impulse; and second, as a matter of experience, the deliberate actions of the as a matter of experience, use destroyers accords or the average man will for the most part be in the line of the algebraic sum of motives, though none the less free for that. These facts, and not the postulates of Determin-ism, are the basic supposition of social and conomic

The difficulty presented to Determinism by the moral order deserves more serious consideration than the jaunty contempt of Mr. Stinson. The conviction of moral obligation, of responsibility, of merit and desert for deliberate actions, is a fact of inner experience common to all mankind. This appears with the da mon to all mankind. This appears with the dawn of reason in the individual, and is utterly incompatible with anything save a real freedom of action To say that all contribution to advancement in educa-

tion and social reform has been made on the supposition of Determinism as against Freedom of Will is a purely unsubstantiated assertion, and is in nowise strengthened by the corroboration of one whose claim to authority arises from valuable work in another field. For a detailed discussion of Free Will and Determinism

For a detailed discussion of Free Will and Determinism I would refer anyone who is interested to the admirable work of the English psychologist Maher. ("Psychology," Longmans, Lendon and New York.)

Bt. Louis, Mo. W. H. Aonew.

W. H. AGNEW.

# Solution of the Steel Rail Problem

#### A Method of Producing Sound Ingots

Dulla Not the winter months of 1906 to 1907, there was such an alarming increase in the number of broken rathe on railroads that the Niste Ball-road Commission of the State of New York made an investigation and published a report which covered the winter months of 1906, 1908 and 1907. The alarming facts were brought out that the number of broken rails removed from the tracks in 1905 amounted to 1,278, in 1906 to 904, and in 1907 to 2,859, the increase in the number of broken rails in the State of New York in 1907 over those in 1900 being, therefore, about 390 per cent.

The Scientific American at that time made a careful investigation of the subject, in the course of which every facility was

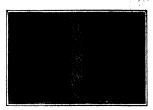
afforded, both by the engineers of our largest railroad companies and by the leading manufacturers of sted rails. The investigation was made by the Dditor in person, and he was given exceptional facilities for examining the private records of the railroads and the minutest details of the process of manufacture by the railmails. The engineers of the railroads stated that

ralimits. The engineers of the raliroads stated that they were anxious to secure rails only of the very highest quality, and that, if it should be shown to be necessary, they were willing to pay the highest price which might be demonstrated that the manufacturers, on the other hand, emphatically declared that, subjected to the dorse that the manufacturers, on the other hand, emphatically declared that, subjected to the conditions imposed by the limitations of the Bessener process and by the necessity of running their mills at the rullest capacity, in order to meet the enormous de man of for rails, they were making the very best possible rail

that could be produced. At that time rails were made almost entirely from Bessemer steel, and if was urged that if the open-hearth process were used, it would be possible to secure sound ingots and reliable rails.

The SCENTIFIC AMERICAN found that the deterioration in the quality of the rails in those days was due to the inferior quality of the steel used in their manufacture, and that the inferior quality was due to two facts;

First, that the ore from which the steel was being made contained a larger amount than formerly of an impurity which could not be removed by the Res semer process, and, second, that the manufacturers were using a portion of the steel ingots from which the rails were rolled, which formore stringent specifications of railroad engineers, was rejected and scrapped—this being the upper portion of the deep cavity, or pipe, from which most of the mischief arose The engineers dained that brok rails came chiefly from that portion of the ingots which formerly was reject-ed under their specifications, but which the mills were now





Longitudinal and cross sections, showing defects in typical American ingots.

incorporating. They stated that, if a larger portion of the imperfect upper portion of the cast ingets were rejected, it would be possible, in syste of the depreciation in the quality of the ores, to roll a rail which would stand fairly well up to its work. On the other hand, the manufacturers understood that if a one third or a one quarter croy were made from the top

in order to meet the slowing down of the speed and the siterings of the supply that would result; form times improvements to meanthristics, to reault the duty meanthrist of the surface and the duty meanthrist of the surface have been this to mild up and set in operation sufficient open-departs; plants to supply the full demand of the open-

In the intervening half dozen years or so alone we made this investigation several open-bearth plants have been devoted to the manufacture of steel ratile; but it cannot be said that this process has given results commonwrate with the expectations of that time. Generally speaking, the open-hearth to the Beasemer rail; but it is attill sub-

rail is superior to the Beasemer rail; but it is still subject to the troubles arising from segregation and piping, which are present, even when the open-hearth process is used, and still are to be reckned as the principal causes of the all-too-frequent breakage of

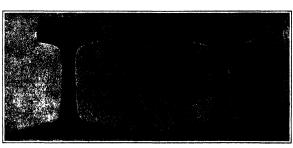
In their order of importance the defects in steel rails

ance can derects in steel ralls are due; fart to pipes and blow holes in the ingots; second, to segregation in the ingots; said, third, to too great haste in the rolling of the rails. The first is by far it he most serious. When the mottes itsel is poursed into the ingot model, cooling at once begins to set in, taking place from the bottom and outside in-wardly. The shrinkage of the metal causes the surface of the mottes metal to sink, the depression increasing until finally there is a deep, roughly content shaped hole of large diameter at the top of the ingot and decreasing as it descends, this cavity or pipe extending from say a quarter to sometimes more than half the depth of the opts of the health of the opts of the health of the opts of the opts of the depth of the opts of the opts.

ingot. When the ingot is reheated and put through the rolls, the cavily or pipe is closed up: but the temporature of the bloom from which the rall is rolled is not sufficiently high to sillow the surfaces of the pipe to be welded together, and, consequently, in the worst cases, there will be an inciplent line of cleavage or fracture, strending through the center of the rall, which is generally undiscoverable by any surface inspection. Under the bammering of

the hammering of modern heavy traffic, especially in cold weather, this inherent weakness is revested, particularly at the ends of the rails, which frequently split open, large sections often being broken entirety away.

being ottures been personal is a tendency on the part of the chemical constituents of the molten steel to become able toward, the top of the input, and the offset is most notices the molten steel to become able toward, the top of the input, and the effect is most notices able toward, the reliability of the a toe it has the effect of imput, and the other past face is the control of the past face is the control of the past face is the past face in the control of the input of the inpu



Cross sections of American rails, showing how defects in ingots appear in the finished rail.

of the ingots, it would mean an immediate and very large reduction in their output, a reduction which, because of the increasing demand for rails, they were unwilling to make.

We suggested at the time that the proper solution of the difficulty would be to make the one third crop as requested; roll rails of the very highest character that could be secured under the Bessemer process, and



First ingot, untreated steel; No. 2, 0.036 per cent aluminium added; No. 3, 0.09 aluminium-added; No. 4, 0.09 aluminium and Hadfield top heating, showing absence of piping and segregation.



Pouring the motion steel into a set of taget molds. Above each is a feeding head, and a bed of sing and blast-heated charges delering solidification of the

ding the n setal at the top of the inset b sting the metaling the metal at the top of the inger has on inger, inger, in the medium state by gue generated bent; gentleus methods have been deviced for compressing a step in the ingers from the sides during cooling, use of theme methods have been illustrated from time Secure of these methods have been Himsterted from time to them in the Scuparryic Amsmora. The objection to most of them has been the heavy cost of the appuratus and the consequent increased cost of the rail. For some years past Sir Robert Endfield, the cele-

ited steel manufacturer, has been carrying experiments at the Hecla works, Shefon experiments at the Hecla works. Shef-field, directed to the production of perfectly sound steel ingots, and he has met with such success and is so well satisfied with the commercial utility of his methods, that he re-ceptly read a paper before the Iron and Steel Institute, which has attracted world-wide at-tention. The ingots dealt with in that paper are chiefly those of medium size, such as are used for rail production, varying from half a ton to two and one half or three tons each, and from 8 or 10 inches to 20 or 24 inches equare.

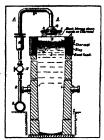
square.

In a recent letter to the Editor, Sir Robert
writes: "Judging from the discussion on my
paper, there seems to be some misconception
in the minds of many that the system I have described covers only the manufacture of experimental ingots. As a matter of fact, at least 15,000 tons have been made, concerning least 15,000 tons have been many, owners which I believe a record statement can be made, namely, that to the best of my knowledge and belief, not a single one of the ingots in this large tonnage was imperfect." In the address referred to Sir Robert stated that address reterred to an thought that that this method made it possible to secure perfactly sound steel, and to do it both cheaply and efficiently. Moreover, the process not only insures sound steel, but makes it spossible to use a much larger percentage of the ingots. In many cases, as much as 92 per cent of the fluid steel in the mold is made utilizable; moreover, this is done at small additional ex-

The author of the paper does not deny that ils as now made are of excellent quality, but he claims that it is just the "tenth" case which it is important to im-prove. It is the bad heat here and there, the bad ingots now and then, which gives the fatal rail, involving catastrophe.

Coming now to a description of the proceattention is drawn to the left-hand filustration at the bottom of page 582, which shows a group of four ingots each about four inches square and thirty inches in length, which were made unacially to illustrate and test the ones tion of soundness and piping. All of these show the appearance of the ingots after part of them had been cut away. In the first cass steel was poured into the mold just as it cam

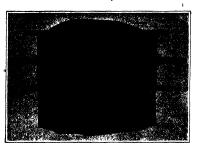
from the furnace, no solidifying addition being made. The second shows the same steel as the first, except that it was "quieted" by the addition of 0.036 per cent of aluminium; it will be seen that this steel is not quite sound. In the third ingot the amount of aluunits was increased to 0.00 per cent. This steel, it will be observed, is perfectly sound, being free from blowholes, etc., but it pipes deeply. So here the stee, maker finds himself in a dilemma. If he makes sheel that will not settle, it is unsound. If he makes it sound, it pipes. And since the portion with the pipe in it must be cut away and becomes waste, and must be must be cut away and becomes waste, and must be ad over again in subsequent heats, there is a loss as. The inventor overcame the dilemma by adding of time. The inventor overcame the dilemma by adding the aluminium and also by using an ingenious and sim-ple method for maintaining the upper portion of the ingots in a fluid condition while the lower portion was cooling and solidifying. This was accomplished by



ingot mold with sing and charcoal bed and air-biast for preventing pipes.



pound steel rail, rolled from inget prepared by



Enlarged view of sand-head, showing the thin layer of slag and the bed of charcoal above it.

using a sinking head and a method of top heating, as described in this paper, the result being shown in ingot No. 4.

will be noted that No. 4 is not only free from the blowholes, segregations, etc., of ingots Nos. 1 and 2, but it is also free from the deep pipe which appears in No. 3. The method consists in heating the fluid steel in the upper part of the ingot, and maintaining it in a liquid condition by the combustion in contact with it, or in close proximity to it, during the cooling and shrinking of the metal in the lower part of the mold, of some form of solid fuel, charcoal, for instance. The charcoal is kept in a state of violent incundescence by means of a blast of compressed air, which is caused to impluge directly on the fuel, while this is directly or indirectly supported by the metal below. Between the layer of fuel and the molten metal is interposed a layer of fusible material, such as cupola slag, which has

the material, such as cupon sing, which has little or no injurious action on the metal. The sing serves to largely prevent radiation of heat, the loss of which, Sir Robert states, is much greater than is usually supposed. Two Illustrations near the top of this page show the arrangement of the air binst, fuel, etc., and note will be taken of the molding-box, placed above the ingot mold and lined with a deep layer of sand, which holds the sinking head in which such piping as may occur will take

Although the ingots here shown are cast with the small end of the ingot downward, which the author of the paper considers to be the better method, his system can be ap-plied when ingots are cast, as they usually are in America, with the large end downward. For this process, however, he considers that it is better to cast with the small end down. since cooling takes place more quickly, caus-ing the steel to congeal at the lower end and reduce the amount of feeding required later on from the upper portion of the mold

Compared with the large saving effected by the decreased loss and waste of material, the additional cost of this method is trifling. The quality of the product is improved, and in the case of rail manufacture, not only is there less discard, but the material throughout the whole ingot is sounder. Sir Robert mentions that ingots have been made weighing about thousand pounds, in each of which the piping and discards did not amount to more than about 7 per cent—a truly remarkable result in ingots of this size. This small loss, moreover, is not the only advantage, the chief one being that the ingot is sound and free from hidden pipes or other defects throughout the whole of its length. On a large output, it is estimated that the saving by this

put, it is estimated that the saving of this method is from \$2 to \$3 per ton.

As regards segregation, we are informed that it is almost entirely absent, only a few inches below the shiking head on the top of the ingot being affected. Furthermore, at about four inches below the surface of the sinking head, which is removed before the ingot is rolled in the mills, the percentages of sulphur and phosphorus were practically the same as in the original steel, that is, about

The practical results obtained by this method are shown in the case of two heats which were made of mild steel and two of ordinary steel. In the mild steel the carbon was 0.20 per cent; stilicon, 0.40 per cent, and manganese, 0.50 per cent. In the ordinary steel, the carbon was 0.45 per cent; stilicon, 0.50 per seet, the current was very per cent, when you per cent, and manganese, 0.80 per cent. The ingots were prepared in the manner described above. The results obtained are given in Tables I and II. Fourteen ingots

(Concluded on page 553)



Two billets rolled from the 11-inch ingot below. Note the small discard.



Application of the second second



un-inch inget, weighing 1,650 pounds, east by the delayed-cooling method, on this inget was eshiel down into blooms aggregating thirty feet in length it necessary to discussed with two feet six inches.



5 inches from end, showing last trace of pipe.

#### Col. Gorgus Receives the Buckman Medal

IN conformity with ancient custom the Fellows of the Royal Society met on St. Andrew's Day on the occasion of their anniversary for the purpose of slecting a new council and to hear the presidential address. At a point in the discourse from the chair the gold medals at the disposal of the society are bestowed upon medials at the disposal of the society are bostowed upon the respective recipients. Special interest attached this year to these gifts from the fact that the Buchanan medial was awarded for the first time to a distinguished American scientist, vis. Coi. William Crawford Gor-gas, assistant surgeon-general of the United States Army.

The medal in question was founded in 1894 in honor of Sir George Buchanan, F.R.S., an eminent London physician and sanitary reformer, who died in 1895. It physician and santiary reformer, who due in 1990. It is allotted every five years for notable service in hysiciae science or practice, in the direction either of original research or of professional, administrative, or constructive work, without limit of nationality or sex.

The award to Col. Gorgas is made on the ground his sanitary administration of the works of the anama Canal. Appointed chief sanitary officer at Ha-Panama Canal. vana, Cuba, in 1898, he, there, for the first time, applied the sanitary methods which enabled the American Goverument to clear yellow fever almost entirely from Havana. In 1903 he was promoted to be colone ant surgeon-general by special act of Congress for his yellow fever work in Havana. In 1904 he assumed duty in the Panama Canal Zone. Col. Gorgas has carried out sanitary work in the tropics on a grand scale. He has been called upon, moreover, to lead the way in the prevention of a new class of diseases, namely, those that are carried by insects. In organizing this departure he was obliged to employ new weapons under w organization, requiring fertility of reson etermination in the face of innumerable diff His success at Havana was undoubted; and since his transference to Panama he has still further advance the technique of tropical sanitation.

The other medallic awards made by the society were s follows. The Copley medal to Prof. Felix Klein of Göttingen, for his researches in mathematics. The Rumford medal to Prof. Heike Kamerlingh Onnes, for his researches at low temperatures. The Davy medal to Prof. Otto Wallach of Göttingen, for his researches in chemistry The Darwin medal to Mr. Francis Dar-win, F R.S., for his work in conjunction with Charles in, and for his researches in vegetable physiology. The Hughes medal to Mr. William Duddell, F.R.S., for his investigations with technical electricity. His Majesty the King approved the award of a Royal medal to Prof. W. M. Hicks, F.R.S., for his researches in mathematical physics; and a Royal medal to Prof. Grafton Elliot Smith, F.R.S., for his investigations on the comparative anatomy of the brain.

#### The Motion Picture Film in Court

An appeal taken from a decree on a bill by the Motion Pictures Patent Company against the Chicago Film Exchange for infringement of patent 580,108, granted to Thomas A. Edison on August 21st, 1897, resulted in a reversal of the decision of the lower court, and in a declaration that Thomas A. Edison was not the pioneer inventor of the moving picture film. In the patent in question, claims 1, 2, 3 and 4 cover the camera and claims 5 and 6 the film. A claim covering the photographic film seems to have been the bone of The Court said

"The flexible, transparent or translucent tape-like film prepared for taking photographs was not discovered or produced by Edison It was brought to its preent state of perfection by Eastman. He (Ed ent state of perfection by Eastman. . . . He (Edison) provided it with perforations along the edges at regular intervals into which the teeth of ratchet wheels of the camera entered to give it the required motion; a mechanical contrivance to adapt it to the performof the functions of the machine. This co-operation of the rows of holes with the teeth of moving wheels he had described in a caveat in 1889 as similar to that in the Wheatstone telegraph instrument for insuring positive run of the band. Moreover, perforations had cositive run of the band. Moreover, perforations had seen previously made in photographic films for feeding

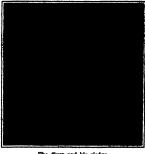
"We do not dissent from the proposition that Mr. Edison solved the problem of the motion picture art with great ingenuity and skill. But the problems that with great ingenuity and skill. But the problems that the solved were in the camera apparatus, wherein his true claim to invention lies. . . . The long, pliant, translucent, celluiold film with the sensitised surface was the invention and improvement of others. The pictures taken on such a film are photographs. It is the particular character and arrangement of those pic-tures for which Mr. Edison is entitled to credit. But those pictures and their arrangement are nothing more than the result of the operation of his improved camera apparatus. The problem that was solved by their pro-duction and arrangement was a problem of the camera

"The invention of Edison was exhausted in the con-

struction of the camera which enabled the obof moving objects to be these mans the photographs of moving objects to be these mans the flastman flish it the distinct, uniform and antespector, minuse (use claimed for them. The pictures takes are the claim result of the mechanism of the consers with the Rass man film mechanismity adapted to noid applied thereto.

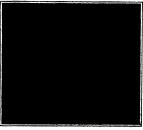
#### The Submarine Sledge By the Herlin Correspondent of the Scientific American

THE divers art has been known ever since the re-This diver's art has been known ever since the ver-motest anisiquity, and vero with prinsitive peoples there are men enabled by their personal skill said long practice to remain below the surface of the sinf for a' relatively long time and to bring up objects from the shallow ground. But only in quite recent times has this art mede any real progress by the invention of special divers' suits, affording sirtight protection from the water, and supplying the man, through a length of



The diver and his sledge

municating with the surface, with the air re quired for breathing. Being thus in a position to remain below the water for a considerable length of time, fully protected by safety devices, divers have in cent times rendered most valuable services to engi-ering and navigation, e. g., in connection with subrecent tim marine building and ship repairs. Apparatus has also been invented which makes the diver practically inde-



On the point of gliding to the bottom,

pendent of the outside world; containing as it does everything required for the regeneration of the siz breathed out by the man, this outfit allows of several

the man, this dutal allows of several hours' work below water.

The latest advance in this direction, however, is the submarine sledge, designed and constructed by the inventors of the self-contained diving outfit described in our issue of October 5th, 1912. This is a sledge towed by a motor boat, and on which the diver glides com-

by a motor boat, and on which the diver gildes com-fortably to and for at the bottom of the see, steering his vehicle vertically as well as laterally. The submarine isides, which greatly increases the capacities of divers, is intended to convey the mea-mightly from one place to another, a.g., in searching for lost torpedore, discovering and securing submarine mines, or handling torpedo batteries. However, its use mines, of handing torpedo betteries. However, its use in ascertaining the position of founded vessels is quite as important; divers equipped with the most recent diving outfit are, on this sledge, in a position to recommittee most rapidly a considerable submarine region at depths down to 130 feet.

region at depths down to last test.

The diver, having seated himself an the stedge on board the accompanying vessel or motor boat, is lowered to the-depth of the sea on a siltle or by means int, a dartit. On two lengthy sledge runsars best up for 
front and connected, by a curved bow are placed the

The state of the s

The duration of this autmarine journey is dep on the working of the air regenerator in the diving suit.
The capacity of the potash cartridge, for absorbing the
carbonic air breathed out by the diver, will be exhausted after about three hours, when the fiver must return to the surface for a fresh potash cartridge. The diver need have no fear of the pressure of water

enrrous even in the case of a high speed of traveling. The protective shell behind the seat, in fact, keeps him quiet water, the spiral water currents set up by his tion coming out behind the shell. In full daylight, no artificial lighting is required for exploring depths of about 130 feet. In order, however, to work in the dark, the diver should carry submarine lamps unthe care, the civer should carry submarine tamps na-less the sledge be provided with a searchlight fed with current from the motor boat. The diving equipment affords an effectual protection against accidents. The linerite of the water, by the way, makes itself bob in a striking manner on a submarine journey; the shock a straing manner on a sucomarps pourney; the shork on the rocks or against other obstacles in damped mast effectually, the strange vehicle moving in its medium with the same swiftness and doublity as an accoplane. In fact, the advant of a new sport, that of submarine travel, may be foreseen for the near future. The total travel, may be foressen for the hear ruturs. The total weight of the apparatus without telephone is 430 pounds, and 530 pounds with the telephone trainmitter, receiver and auxiliary apparatus. This equipment was utilized recently by a diver to descend to about 70 feet below the surface to inspect the intake of the electric power plant of the city of Lui eck, Germany.

#### Panama Pacific Exposition

I N an address delivered before the New York Elec-trical Society by John A. Britton, some interesting information was given on the Panama Pacific Exposi-The development of the Exposition has pro-sed so far, Mr. Britton said, that the work is sight months ahead of schedule time.

The first building, the Administration Building

The new building, the Administration Suilding, is almost complete. The foundation has been laid for the Machinery Hall, a structure over 600 feet long and 320 feet wide. Approximately 600 acres of land over the bay shore have been filed in. About 1,500 houses that covered the site have been bought, besides a number of manufactories. The streets of the Exposition have been laid out. Already some 60,000 trees and shrubs have been planted. Soon 40,000 more will be set out.

us far \$16,000,000 has be \$6,000,000 was contributed by the public of San Fran-cises, \$5,000,000 given by the State and \$5,000,000 by the City. When the doors of the Exposition are epened

tility will be no debts.

"Alle area covered by the Exposition will be 1,100 asses. On lock sides, east and west, it will be fanked by the Germment Reservation, to the extreme west by the Periaddo, one of the most beautiful reservation. by the Présidio, one of the most beautiful reservations of the Government tocated anywhere. A strip of land along the shore of San Francisco has been given to the Exposition and a boulevard will be built revise; the Exposition through the Presidio grounds to Golden Spire. Park on the extreme weekers and of their Spinniston. On the easy the Exposition to flanked by Poor Mason, another Government Reservation, and by José Schotz constity tolks by the Covernment at a very genuit engagement.

# Publishing the Air in Rooms

Contifying the Art in Massac.

"I D putting the art of others or other promise parts in few places of the continue of advantage of the putting of the continue of advantage of the continue of advantage of the continue of th



Device for holding dire

snough. The following method will hold the saw se-curely, and allow good sharpening to be done: Upon subseport or igo of a bench, three arms, such about 18 inches long, are botted. On the end of each arm, a small block is placed, as illustrated in the side triew. A hole is bored through the post and the center of the arms, to allow a long bott to be inserted. The hold the access, to assew a cong out to be inherited. "Yo note the sew, place it upon the arms, and put the bott and sut 8 in place. When tightening the nut 5 the saw will be drawn firmly against the blocks on the three arms. When filing the saw, it will not allo back or forth, an it would in the other clamps.

#### Some Workshop Suggestions By B. F. Dachiell

FFHE following are a few werkshop "kinks" that have proved helpful to the writer, who hopes they may prove equally helpful to others:

Device for Holding Nuts in a Monkey Wrench.
It is quite an advantage sometimes to be able to hold a nut in an ordinary monkey wranch, when it is to be applied to or removed from the bolt. An ordinary wrench may readily be adapted to hold a nut if one of wreach may readily be adapted to hold a nut if one of the jaws be provided with a piece of syntag shest metal as illustrated. (Fig. 1.) This spring is prefer-ably applied to the stationary jaw, to which it is se-cured by a screw. The jaw has to be drilled and tapped to receive the screw A which holds the spring. A slight curve is given to the spring so that it will hold the unt firmly in the law.

Vise Pilera.—A pair of pilers is virtually a hand vise without any messus for holding the jaws in fixed position. There are some pilers, however, on the mar-ket which are provided with such a holding device and those pilers are known as vise pilers. It is a simple matter to provide such an attachment for any pair matter to provide such an attrachment for any pair of pliers. Fig. 2 shows how this may be done. A piece of heavy strap metal A is bent to a U form and is fastened to one of the jaws of the piters with a pair of small machine screw. A set-ever is threaded through the strap as indicated at B in the drawing. When this screw or boit is tightened upon the jaws

if histin the pilers firmly upon the work, leaving the hands free for other duties. If this holding device is applied to a pair of pilers of the parallel jaw type, the vice pliers may then be used as a wrench as well as a

Fartesian Hammer Heads on Handles.—The heads of hammers and hatchets have a strong tendency to become foose and work off the handle after a time. Not only is this annoying, but it is positively danger one. A simple method of overcoming the danger is to drill a small hole transversely through the side the hammer or hatchet to admit a small screw. The head may then be fastened to the haudle by means of this screw as shown in Fig. 8.

Files for Large Surfaces.—When filing a large and flat surface, the file handle has to be raised above the plane of the work. This can be readily done by annealing and bending the handle up. The drawing (Fig. 4) shows various form of fles thus bent. With such files it is then easy to go over the whole of the work and use the entire file, without having the handle in the way.

Resping Olistones True.—Oilstones soon become hollow in the middle due to the fact that the ends can-not be used. If two blocks of wood are glued to a base on each and of the stone the whole of it can be used, as the tools slide out on the wooden blocks. The drawing (Fig. 5), published herewith, illustrates the arrangement.

#### Why a Plane "Iron" Has a "Cap" By W. D. Graves

M OBE completely than almost anything else are the tools of mechanics free from all superfluous parts, a soots of mechanics free from all superfluous parts, and there is arely even a variation of that outline but that has maserial effect, on their neckliness, though that effect is not always immediately apparent. The tacks driven by a cobbler do not differ much from those driven by an uphelapter; yet there is good reason for the vary wide difference in their hammers, as there is also for the difference in the new terms of the terms. also for the difference in the mauls used by the ship caulker and the stone cutter. While it may be instruc-tive to study the reasons for these differences, even though one does not expect to "clout shoon" nor caulk ships, it is better, first, to be sure that one fully understands the significance and value of all the parts of such tools as all of us are apt to find use for. With such knowledge of the common plane, for instance, we may be able to accomplish work which would otherbe wholly beyond us.

The thing about a plane the reason for which seems least understood is that—except in a few special forms—the cutting member is made in two parts; the "iron" proper, which does the actual cutting, and the "cap" which is alidably bolted to it. This "cap" is absolutely essential to the accomplishment of the best work with a plane; yet even some joiners do not fully under-stand its application. Its office is to break the fiber sould its approximation. Les ouces is to better the notes of the shaving, holding it down meanwhile, so that it shall be severed from the wood directly by the cutting edge rather than be torn away by a wedge-like lifting section.

To illustrate roughly let us suppose that we wish to remove, with a jacknife, a thin sliver from the top of the piece of wood W, in Fig. 1, in which the grain runs in the relative direction indicated by the broken lines. When practicable, of course, we would begin the cut at the right, cutting "with the grain;" but in the supposition case we will begin at the left. If we were to press the knife blade directly

in from the point A, the split would run a little ahead of would run a nettle anead of the knife edge and follow the grain to F. If, however, we press the blade in a little at a, then tilt it sharply up-ward, a short piece is broken off. If we now press the blade in a little at b, c, d, etc., press the breaking off a piece each time, we will eventually have roughly removed a thin layer from A to B. This is essen-tially what is done by the plane iron and its cap, except that the shaving, being thin, is not broken entirely apart. is not proceen entirely apart, and being thrust downward when it is broken, it is not pulled away from the wood, but is first severed therefrom

but is first severed therefrom by the sharp cutting edge, then thrust away. The diagram, Fig. 3, Illus-trates how the shaving, im-mediately after the cutting edge lifts it, is thrown sharp-by ferward and broken, at

downward, by impinging on the end of the cap. In working hard and cross grained woods the cap is placed very close to the cutting edge, so that the breaks in the fibers of the shaving are very close together in



Fig. 1.—Planing against the grain without a cap.



Fig. 2.-How the cap breaks the shaving.

deed. As this necessitates the taking of a correspond-ingly thin shaving and makes the plane push much harder, it is customary to set the cap farther back in planing softer woods with the gruin, or in cases where smoothness is not specially defired. It is essential to good results that the tip of the cap be fitted very satgly against the front of the Iron in order that the shavings may not crowd under it.

#### Steady Rests for Small Lathes

By Albert F. Bishop

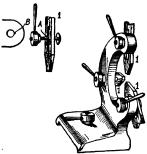
WHEN the jeweler wishes to reduce a slender wire in the lathe by filing he simply holds a piece of hardwood with a small notch in it under the wire. This will steady the wire so he can file it down quite rapidly. Jewelers prefer boxwood.

A simple form of steady rest is shown in one of the accompanying drawings. In making this rest it is necessary to construct the body of cast iron. The jawa marked 1 are made of hickory. Do not use fiber. The



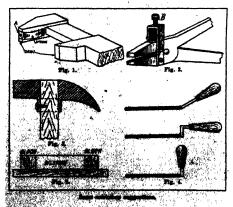
The jeweler's steady rest

hickory jaws are slotted to allow for plenty of adjustment. Small holts pass through the jaws and are tightened with a lever nut. The bolt has a large flat head, also a small pin marked A, which fits in a groove



Simple steady rest for small lath

in the steady rest marked B. This groove is easily filed in. The lever nuts should be adjusted so that when they are tiphtened the levers will stand away from the center. This gives plenty of leeway in setting the jaws on the work.



# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### A Machine That Washes Fourteen Thousand Dishes in an Hour

By Jacques Boyer

W ITH the aid of Hamet's automatic dish-washing machine, which has been in operation for some little time in the kitchens of the Samaritaine home, in Paris, one man can rinse, sterilize and dry 14,000 plates in an hour. The machine is made of forged and drawn steel, and is very strong and simple in

Its principal feature is a rotating drum nected by six cylindrical rods, from which are suspended six pans loaded with dishes piled in tinned-iron racks. The trunnions of the drum turn in bearings which are mounted on opposite sides of a trough 55 inches long, 31 inches wide and 22 inches deep, containing water which is heated to the boiling point by coke, gas or steam. The height of the machine is 37 inches.

At the Samaritaine the work is ex-

pedited by assigning to the machine a number of men who wash the plates roughly by hand and pile them directly in the racks which are turned on end for this purpose, so that the plates stand on edge when the racks are again set on

The operator of the machine puts one and, by pressing downward on the bar. turns the drum through one sixth of a revolution In this way the loaded pan is lowered into the hot water and the next is brought into position for loa

When all six pans have been loaded by

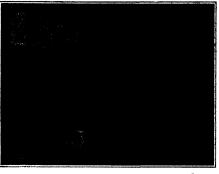
repeating this operation, the first pan is again in the loading position, and the plates carried ve been thoroughly rinsed and sterlized by suge through the boiling water, and dried by by it have been thorexposure to the air during the remainder of the revolution. The racks containing these plates are then re-moved from the pan and replaced by racks of partly washed plates, and so the operation goes on indefinitely. It is not necessary to balance the pans carefully, as the motion is controlled by a brake, which also pre-vents the drum from turning backward when the finished plates are removed from the pan.

It takes about 10 seconds to unload and reload a pan, and there are always two pans in the water, so that each plate is immersed 20 seconds. When two racks of 20 plates are placed on each pan, therefore, the machine turns out 40 plates every 10 seconds, 240

The operation of the machine requires very little

effort, as the ascending and descending ly balanced. The dishes machine abso lutely dry and glossy, as the writer can testify from personal observa-Hence it appears probable that many hotels, restaurants, hospi-tals, schools, etc., will adopt this simple apparatus, which effects a great saving in labor

For use in smaller estab-Hamet has constructed a smaller ma-chine based on the same prin-ciple This apparatus has only one pan which is suspended from a double scale-beam and balanced by a counterpoise. The beam turns in bearings mounted on the sides of a trough filed with boiling water. The apparatus is so constructed that the pan, whether heavily loaded so constructed that the pan, whether nearly loaded or empty, remains in stable equilibrium in the loading position and also when immersed. The machine is operated by one man who roughly washes the dishes by hand and deposits them in racks. When he has



Fourteen thousand dishes rinsed, sterilized and dried in an hour.

filled two racks, he places them on the pan and lowers them into the water, where they remain until he has filled another pair of racks with roughly washed dishes. milet another pair of racks with roughly washed oakes. He then raises the pan by tipping the beam and substi-tutes the second pair of racks for the first pair. The rinsed dishes dry in a few seconds. With this little apparatus 2,400 plates can be rinsed in an hour, with an immersion of one minute, and the number can be increased by shortening the immersion

#### Twelve Thousand Postage Stamps Per Minute

By Thomas D. Gannaway

To print, gum, dry, perforate, and either cut into sheets or wind into coils twelve thousand postage stamps in one minute, seems an impossible feat to even an experienced man. But a new departure in the art of plate printing is being made in the Bureau of Engraying and Printing; a change which has been cought many years with disappointing results by practi-every civilized nation in the world. This secuningly possible feat remained unaccomplished natil the possible feat remained unaccomplished until the com-pletion of a machine, which was designed and built by Mr. Benjamin E. Stickney, Mechanical Expert and Designer of the Bureau, under the direction of Mr. Joseph E. Ralph, Director of the Bureau of Engraving and Printing. Heretofore it was necessary to wet the

Hereofore it was consent to make the paper and allow it to become mallow bepaper and allow it to become mallow bepaper and allow it to become mallow bepaper and allow it to become mallow beprobably income and the paper of the paper

sions in the plate and thus pick up the required amount of ink to make a perfect impression. It requires a tramendous sure to accomplish the same results on dry paper; a pressure that cannot be obtained on an ordinary plate printing press. In the old process, as the paper has to be wet and allowed to mellow, the printing cannot be done on a continuous roll, but sheets have to be used.

Until two years ago, when Mr. Stickney invented a machine for wetting paper on which money was to be printed, all paper for plate printing had to be wet by hand.

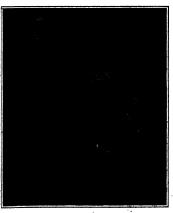
A wet rag is placed between every twenty sheets of paper, and they are then put under elight pressure in stacks of 1,000 sheets and allowed to remain over night. To distribute the moisture more evenly these bunches of twenty have to be taken out and split in the middle, turning the wet sides together, and then re-stacked with a new set of wet rags and allowed to remain under slight pressure for mother night, after which the rags must be removed. Mr. Stickney's new invention does away with all

this labor, as it prints from a continuous roll of dry paper. There being no sheets to handle as the process of manufacture is going on, there, consequently, is no necessity for the many counts of sheets as in the old

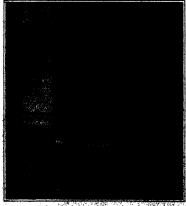
The new machine eliminates nineteen operations in the manufacture of postage stamps and will work a saving of about 57 per cent of the present cost of them.

The process is as follows: The roll of paper is placed in a holder which stands off a few feet from

the machine head to the top of the press, then down between the feed oller and the printing cylin der. This feed roller is so arranged, that by turning a small wheel, a tremendo u s pressure can be put on the top of the printing cylin-der where the paper be over it, thus enabling the enabling the printing to be done on dry paper. Just paper. Just back of, and half way up the side of the printing splinder to the interior section for the side to the interior section.







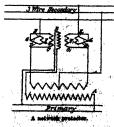
Pooling the paper to the printing spin

This, a minutes, of more! August, which covers a cost eight inches wide and the full months of the originate. They are so con-structed that they vibrate back and forth jungthwise of the cylinder. Passing over this is a winting belt which vibrates with the maint fingues at high speed and at the me time moves slowly forward, thus spring away the ink as it is wiped of and at the same time insuring a clean portion of the cleth to polish the engravpercent to possess the possess the search to the service the set is when off. This is succemplished by having the wiping cloth salve slowly from the front of the cylinder toward the inking fount. As the engraving leaves the point of contact with the wiper, it is evenly wiped and polished as nicely as if it were done by hand. The paper passes from the printing cylinder to the top of the machine again, and through a group of tea electrically heated cylinders where the ink is dried. From here it passes to the ning fount, where it is automatically gummed, and passes from there into the steam-heated drying shaft, which is about twenty-five feet long. This shaft has a series of rollers and belts in it which the stamps through to the perfor ator. As they pass through this shaft the gum is dried, and by the time they reach the perforator, they have dried sufficiently gum is creed, and by the time they reach This balance of conditions is maintained at the perferator, thay have dried sufficiently all loads and is only upset by a reverse outto permit of packing. They enter the pergtrain flowing from the secondary network foractor from the drying shart and then into the transformer, as is occasioned by a 
the slitter and coller, where they are cut short strough in the latter. This condition 
into ten strips of the width of one stamp immediately reverses the relative polarity 
and colled into cells of the desired size, of the colle C and C, thus energiating the 
This portion of the machine may be 
ore and causing a heavy short drivuit cutchanged so that it will cut the roll of 
ment to few themosph the cells E and E. by This portion of the machine may be core and eausing a heavy short circuit our-changed so that it will cut the roll of rent to flow through the coils E and E, by stamps into sheets instead of slitting and

The manufacturing of our postage The manuscritting of our postage stamps is a much larger task than the average person has ever dreamed of. It takes about forty millions of postage stamps (of all denominations) per day to supply the American people. Is it any wonder that efforts were made to devise some more rapid means of printing them? In the course of a few years' time the new machine will have saved the Government machine will have saved the Government several millions of dollars on the cost of postage stamps alone. The passage of the postal savings and parcels post acts has greatly increased the demand for stamps. Of course, this increased demand can be more easily met by use of the new ma under the old method. The introduction of a few reforms like this will certainly make nenny letter nostage nossible

#### A Network Protector

In the distribution of alternating current for light and power in congested com-munities, it is the common precisic to group the customers, extending the low voltage or secondary distributing main over voltage or secondary distributing main over or large units at convention prices and con-trol and the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the contro N the distribution of alternating our



that in case one transformer ing a short dispute on the sp ayetem, the select temperatures in p the state from the selection

called upon to pick up. Also the transformer will draw a short circuit current reamer wat craw a sance onecit current from the secondary line, which further in-erases the load on the remaining trans-formers. The nearest transformer will take up most of the load, causing its fuse to blow Which in turn will cause the fuse of the nevi which in turn will cause the fuse of the next ones to burn out, and so on through the en-tire system. To overcome this defect, an inventor has devised the protector shown in the accompanying diagram. At A is a commercial transformer, one terminal of the primary being connected in series with a coil B of a current transformer. The terminals of the secondary of the commercia transformer are each connected through its own coil C and  $C_1$  on the current transown out t and  $t_1$  on the current trans-former. These latter colls connect to the middle point of the looped fuses D and  $D_1$ . One side of the fuses connect from E and E, to the outer conductors of the 3-wire network. The fuses D and  $D_1$  act as a short circuit connection on coils F and  $F_1$ . The function of this combination is that unde normal conditions, the currents in the primary B and the secondary coils C and primary B and the secondary coust C and  $C_1$  having the same ampere turns and connected in opposition will neutralize each other so that there will be no m. m. f. circulating in the core of the current transformers to energize the coils E and  $E_1$ . This balance of conditions is maintained at rent to flow through the coils E and E, by way of their above dreviling fuses D, and D. The heavy short circuit current through the fuses immediately ruptures them and isolates the main terminals at G and G. A apply of current sufficient to blow the V fuse is obtained with a reverse current in fue is obtained with a reverse current in the secondary of about one quarter full load current on the transformer. The de-fective transformer will thus be instantane-ously ust out and disconnected from the line, allowing the remaining transformers connected to the network to continue their function, taking up the load of the defective transformer with no resulting interrup n in the servi

#### Simplified High-potential Apparatus By Our Berlin Correspondent

THE writer a short time ago had the good fortune to see a most interesting d useful apparatus developed by William Dubilier on a recent trip to the Conti-, where his radio-telephonic system is to be adopted by the governments of sevest countries

This apparatus purports to place the u of electric waves for X-ray treatment and photography, and for other medical pur-poses, within the reach of everybody. It is of electric free from any heavy and complicated de vices, so that it requires but one operator and may be worked by a layman as well a

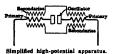
The apparatus is based on Dubilier's method of producing undamped oscilla-tions with an uneven amplitude as used in his wireless telephone. It is contained in a box of the 9 × 8 inches and comprises two transformers, a quenched-arc oscilla-tor and a small condenser. Though only weighing 15 pounds, it allows a heavy disharge of over 6 inches to be obtained.

h of the transformers, which are de signed on entirely new principles, contains two secondaries with a primary coil between them, which are so constructed as to pro-duce very little magnetical leakage. The duce very little magnetical leakage. The ore traverses the center of these soils, and these are so would said arranged as to bitain resonance. A small variable quencher or cedilator is used as attituterquier which is so designed that for resistance always varies so as to obtain a large diamformation of energy. This cedifiates is so consected with the primaries that the industance of these coils with visiable currents is less than in the case of gies obtaing current is less than in the case of gies obtained our which can be used to the contract of the country of the

With a primary current of 2 amperes and 110 volts—either direct or alternating the discharge obtained from the second is sufficient to operate large X-ray tube for photography.

The problem of insulation is solved by

using a vacuum drying and impregnating apparatus with a layer of solid, pure insu



lating material between each two layers of the secondary. The machine is of remarkably low weight, and therefore can be readily carried to a bedside.

#### The Maxim Motorboat Silencer

M UCH space has been given in the newspapers to the silencer for motorboats invented by Mr. Hiram Percy Maxim. Inasmuch as foreign putents are pending, it is impossible for us at the present writing to give a detailed description of the invention. However, Mr However, Mr. Maxim informs us that the silencer is en tirely different from any of the so-called mufflers in common use on motorboats Mufflers accomplish only a diminishing of the sharpness of the exhaust and do not really slience it, he claims. They ac-complish the former by providing an expansion space and a tortuous outlet passage. Their effect is only that resulting from slowing down the velocity of the gas as it issues into the atmospher Mr. Maxim states that the noise of the

exhaust of a two-cycle engine consists of two separate noises—a fact generally unknown up to this time. One of these noises, called by him "the primary noise," is originated close up to the exhaust por is originated close up to the exhaust port of the engine, where the gases issue at an extremely high velocity. Whenever any object passes through the air at a velocity in excess of the velocity of sound a sharp "crack" noise is developed. This was first made apparent when the Maxin silencer was used on firearms. Although the silencer would entirely eliminate the report produced at the muzzle of the gui by the powder gases, there was a noise heard out in the air beyond the gun, whenever the bullet velocity exceeded the velocity of sound. The exhaust gases from a gas engine, when they discharge have a velocity considerably in excess of the velocity of sound and, therefore, originste a "crack" noise This noise, having once been started, advances at the normal velocity of sound and travels on at the discharge pipe, makes the sharp at the discharge pipe, makes the sharp sound we hear when a motorboat passes. The ordinary muffler is powerless to annul this noise. In the Maxim silenc-er this noise is "trapped" and entirely dissinated before reaching the outlet. The

result is an approximately silent exhaust.

We are informed that very interesting tests have been conducted with the new silencer on engines attached to a dynamometer to determine its effect upon horse-power output. On a dynamometer, we are told, there is absolutely no loss of power indicated. Water is injected into the silencer from the water circulation, and this keeps the stiencer always cool. The stiencer can be used without water if destred.

Tests conducted ou a boat in the Connecticut River are of particular interest. The method of test consisted in starting a boat from a landing stage with instructions to the pilot to keep going straight away until a flag waved by the observer on the landing stage indicated that the sound of the exhaust could no longer be heard, whereupon the boat was to return nearca, was rough the boat was to remain and report the distance traveled by log. It was found with the best of saveral muffless on the market that the boat was able to proceed roughly one mile before the sound of the exhaust was entirely lost. The same boat then had its muf fler removed and the Maxim silencer sub stituted. Mr. Maxim claims, and was start ed off again. At a distance of approxi-mately 100 feet the sound of the exhaust was entirely lost.

The diameter of the new sliencer for

all engines up to 25 horse-power is 6% inches. For engines up to 4 horse-power the length is 14 inches. For ens up to 8 horse-power the length is 17 inches. For engines up to 15 horsepower the length is 25 inches. An idea of the weight of the device can be obtained from the statement that the 17-inch long silencer weighs 24 pounds

In the construction of the stiencer there are no holes or small passages to clog. In their passage through the sliencer, the exhaust gases add themselves to gas travel-ing in the same direction, and this is the principal reason for the absonce of buck

#### Notes for Inventors

Expansion Chamber for Pneumatic Tires. -Automobile tires frequently burst or blow out because the pressure of the air rises above the limit of safety owing to the heat generated by the friction of rapid travel or sudden contact with an obstacle in the road. In the ordinary tire there is no provision for taking up the excess pressure due to variation in temperature in the confined air, and this is hable to produce injurious strains in the tire which greatly shorten its

life. Recently an inventor has patented a improvement, No. 1,035,207, which consists in providing a reservoir at the hub of the wheel that communicates with the two This reservoir is made of clastic material which is kept under pressure by a springd plate. The pressure of the springs is sufficient or equal to the pressure of the air in the tire. Any excess of pressure in the tire results merely in compressing the springs. In this way bursting pressures are compensated and the dauger of shocks and blows is avoided.

Changes in the Patent Office Force .-Principal Examiner C. C. Stauffer, for many years in charge of Division 15, has resigned from the Patent Office. Principal Examiner G. P Tucker has been trans-ferred from Division 35 to Division 15, Mr. Stauffer's old division, and Principal Examiner A D. Merritt has been transferred from Division 40 to Division 35 The resignation opened the way for the appointment of a new principal examiner, Mr Herbert Lewis, who has been assigned to and taken charge of Division 40 in which he has long been the ranking assistant. Mr Lewis is a native of Haverhill, Mass, a graduate of Amherst College, class of 1891, and sachusetts Institute of Technology, 1893, and prior to entering the Patent Office had experience with the Westinghouse Electric Company in Pittsburg and in Boston as electrical engineer. Entering the Patent Office in 1894 as an assistant examiner, he served in Divisions 8 and 11 until promoted to first assistant in 1907, when he was assigned to Division 40 and has continuously served in such division until promoted to principal examiner Lewis, therefore, has a special advantage in being schooled and experienced in the class being a in his charge

A Shaving Brush That Cannot Fall Over. A Shaving neuron gnat cannot rail over.

—In design patent No. 43,250, David H.
Watts of Olden, Pa., shows a shaving
brush, the handle of which has at its end opposite the brush proper a flattened surface on one side in a plane diagonal to the xis of the handle so that the brush can be supported at an incline with the brush proper elevated off the table, washstand or other surface upon which the brush may be rested

How to Mend a Moving-picture Film. In patent No. 1,044,258, Edward J. Schafer of Seastle, Ore., shows a film-repairing machine in which elamps are provided for retaining the film on a table and presers hold the film down on the table on opposite sides of the broak, the table being transpar-ent, and means being provided for illu-minating the table and film, thus aiding in the repairing operation.

#### RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENWIFIG

#### Of Interest to Par

Of interest to Favencer, AUTOMATIC SIGNION DISTRIBUTER FOR GINNING FLANTE.—B. REED, Box 68, Manaville, Okla. The invention provides a suction pipe having a pair of peanegeway. Each of these is adapted to nave a pircuity of openings in the bottom through which the cottom is discharged. A bedding screen is added to the continuity of the control of the charged.



ATTROMATIC SUCTION DISTRIBUTOR FOR

jacent each opening and is movably mounted so that the same may be moved into the path of movement of the cotton for directing it to any opening. A movable foor is provided for the control of the cotton for the cotton of provided for the cotton of the cotton of the major into a single discharge pipe, to which is connected a gint whereby when cotton is fed to either of a single discharge pipe, to which is receiving cotton. A longitudinal vertical is receiving cotton. A longitudinal vertical engraving.

section through the invention is shown in the engraving.

PLANT RETTING DEVICE—II. R. Glos-son, Priday Harior, Wash. This device has plants, the clamps being opened by a trly when the plant carried by the clamps are disposed in a furrow in the rear of a furrow opener. Press wheels are secured to the de-posed. Press wheels are secured to the de-lay of the plant of the plant of the plant of the have been disposed in position and a water nossie is opened periodically to supply each plant with water as the device is moved along that grown.

HAY PRESS.--E L. WETEIG, Clint, Tex. HAY PRESS.—E L. WERRO, Clint, Tex. The inventor provides means in a press for reciprocating the plunger at regular intervals, and wherein the connection between the operating means and the plunger is of a character to transmit a high proportion of the power of the motor with a long working stroke and a quick return

NYENER.—WILLIAM C. HOPPER, DAWSON.

EVENER-WILLIAM C. HOPPEN. Dawson, Neb. The principle advantage possessed by this evener is that whon attached to a plow the evener is that whon attached to a plow the evener and the transparent with the provent as the provided at a lower level as a straight and direct a poul last they. The device consists of two lars, one six inches above the other, with a link connection at one end. To this link at any desired adjustment vertically thoreon a double-tone is connected while the opposite sends of the barr lars are not connected that the pull of each animal exactly balances the pull of all the rest.

DEVICE FOR ROLDING MRAT.—F. Baicos, 45 Bryant St., N. W. Washington, D. C. This device for holding meat is shown in the regraving in a side elevation, and is especially adapted for that class of meat or hams which are cooked and compressed negliadrical cooking vessels, and is adjustable



DEVICE FOR HOLDING MEAT.

to rolls of different sizes. Both ends of the receptacles are preferably open, so that after the roll of meat is clauped there in time by pushed out at either end for the purpose of cutting of sites, and in this operation the end of the receptacle will form a guide for the halfe so that the sites will be cut evenly.

the halfs so that the silices will be cut evenly. HACK.—O. LYMEN. 220 Helmen Bilds, New Grienas, La. This invention relates to racks to hang or hook onto a radiator and to operate as a combination drying rack, foot rest and hook abcil. The device is portaine and dijustable to be attached to and detached to and controlatile warming of the free without purious to allow principally of a convenient and comfortable warming of the free without purious the above free free without purious the size of the the

enair for warming the back.

FLUME CONSTRUCTION.—J. H. MARTIN,
National Botel, Joliet, Ill. The intention here
is to provide a device adapted for use with
current motors in Mr. Martin's, co-posing application Nov. 22d, 1911, of which the pres-

method with the handle and the common of the principle of the point of

for requisiting the expiration of air from the lungs.

TURPENTINE APRON.—W. O. Date and L. Leano, 69 Authorsey Mt. Mobile, Als. The two seconds of the second of the secon

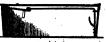
Heating and Lighting.

Frove.—W. P. Prikurson, Millierock, Wyo.
This fire-cage is especially for use in bursting
straw, weeds, cornelling, claff, grain, acreaines, dust, waste paper and other treah and
Mr. Pitherbord former patient No. 880,008,
and provides a stove better adapted for bursting fuels in a green or wet condition and also
for burning the particular kinds of fuel before
specified.

specified.
BLOWFIPE TORCH.—A. J. Reor, 865 Chelsea Avs. Long Branch, N. J. The invention
provides means for preventing the boiling over
of Build lightld, or super-naturation of the supply wick therefor; provides means for manually
supplying the fuel to the wick; and provides
a simplified means for threading the wick in
the lorch structure

#### old Titlitit

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ent case in a division, chereix a company is provided for the motor, and is riskullen assets to the consequence of the content of the content

crease of efficiency.

SRUTYLE, J. GARNON, care of Joseph Menard, 57 Grant Block, Pall Biver, Mass. Mr. Gagnow's investion has for ts purpose the provision of a strong, cheaply constructed shartle without lateral opening or cuts, and whereis means is provided for permitting the shuttle to be quelty and expeditionaly thread-od, and for preventing accidental unthreading.

ed, and for preventing accidental unthreading.
ICE MAKING BEVICE—My. MALUET, P. O.
Box 186, West Berwick, Pa. An object of this
invention is to provide means whereby a numher of blocks of ice may be quickly and chesply
manufactured through the agency of a freeing compound. A further object in to provide
a machina for manufacturing ice which will
accomplish the freeding of the water in very

Ballways and Their Accessories.

Ballways and Their Accessories.

Ballways and Their Accessories.

Bration indicator. W. R. Hill, Rodel Senses. San Francisco. Cal. This improvements of the state of the ear. Of the ear.



tion; peeridae cushions for the railway easily provides cushions for the rails, inhorposed between the rails and concepts deventure in severe the said rails and concepts deventure in severe the said rails and eather them the nature wast by possibility of the ties, which fartenings are heatily investible in possibility in the contract of the contrac in service positi to position pre to service positi

Compared to the control of the contr



Perstaining to Electrosides.
TOT WAGON—E. C. Remarrum, 100 Middi-gas St., Buffalo, N. T. This wapes one be realtly moved abest and need us a mad or dirt wapon. It is built of easily separable pieces to allow a child to realty this the article apart and remains the pieces and twentil the wagon, then furnishing means to occupy the child and give it educational training.

Percentuage to Volucions, 207 E. 70th St. Monten, 207 E. 70th St. Manhattan, N. T., N. T. This first equaliser is adapted for one at reads or other validots, drawn by other one, two cutters animals polling otherwise to the lever-included and the second of the second o



with one, two or three swingle-trees, it bein destrable in some instances that the assumat used with vehicles be changed at short metic and the structure of the device is particular, adapted for such change. The accompanyin ongraving shows a plan view of the device.

engraving shows a plan view of the device.

REALCHLOUTH.—H. RALBURY, 136 LONG.

Acre. London. Regiand, and T. WHITLAREN, 15

Handfields Street, Bulham. London. Regiand

The intensity of a beam of light projectle

from a lamp is here increased without addit

to the size or power of the burner. A greate

cone of light from the front of the flane; in

tillized than has heretorev been possible, this

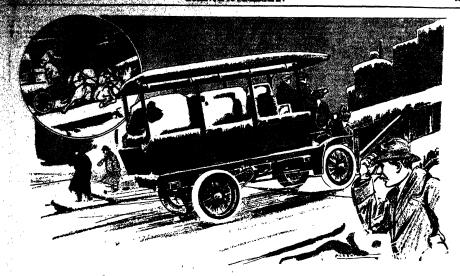
set of the contract of the contract of the flane; or

tillized than has heretorev been possible, this

on that the insonity of the beam professed by

a given burner is greatly increased.

DESTIGN FOR A HANDESECHIEF.—Revest
M. Mirma, Caiville, Wash. Inside the border
of his ornationated design is a large field
of his ornationated for the second second
small size. Between the four sides of the
contreplece and the border are duplied
groups of a, girl and two animals composited
with one another.



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WHEN the temperature goes down your horse-hauling expense goes up. The first flurry of snow forces your borses to work slower than ever. The first ice coated pavements are responsible for the thousands of accidents, falling horses, maimed horses, and hones that have to be shot.

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Winter, to the horse-hauling man, means perishing horses, damaged equipment, costly veterinary bills and big losses due to dissuissied customers. Those merchants and manufacturers who still stick to the horse, lose hundreds of thousands of dollars every single winter, which can be saved. As you cannot change for council the weather the solution lies in changing your equipment.

The Gramm truck is as efficient in zero weather as it is in June. And in June one Gramm truck can do the work of at least three first-class teams. In some cases one Gramm truck can accomplish as much as four and even five teams, but this varies, according to the nature of your business.

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Ends her yes queris on emprison acts of the control of the control

(12711) D. M. C. asks: I claim that a 30-inch whee, the periphery of which year two miles a minute, has a greater contribugal from two miles a minute, has a greater contribugal from the amounte, has a greater contribugal force of a rotating body is given by the formula F= m V m is the mass, Via the velocity, and F= m V m is the mass, Via the velocity.

main F. — "..." as the mass. Vis the vestority, and r is the radiult, or distance of the vestifith from the contex of rotation. In the case which give proper the weight is not given, the rinary elosity of the two wheels is the same, and no does not clease any difference between the two velocies in the radius of the velocity of the two wheels is the same. Therefore, other factors being the same. Therefore, the larger wheel, if of the same weight as the smaller, has only now that the contribugal force, other factors being the same. Therefore, the larger wheel, if of the same weight as the smaller, has only now that the contribugal force as the smaller, has only now that the contribugal force where the same in the same is the small wheel has a much larger anglue velocity that the larger which the same is the same is the tendency of the same is the s

sures through 800 degrees in one third the time of the larger wheel, but this does not affect the occupations of the contenting of the second of t

377

wanted and of the commentation of the organist deservations of the commentation of the organist deservations of the commentation of the organist determination of the commentation o (12713) C. E. W. writes: As a subscriber

All committeetes. Our vest precise, more than elary year to advise in regard t expense to the dient, is sent from on tr All patents control through us are described without cost to the patentee in the SCIENTIFIC AMERICAN

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Inquiry No. 5250. Wested a manufacturer of a patential able for making up pay days up bits and insert them with correspond does would do.

on the pour communication.

(12714) H. C. C. asker I well a desired and the second of the common second of the com



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is speak a meedines invested. I have been informed that use of that description was on arbitetion that one of that description was on arbitetion of the control of the cont

(12715) W. J. asies: Will you kindly wive the common needs which has the heast expansion from beat? Also the meet (common) pandon from beat? Also the meet (common) which has the greatest expansion from heat? These meets should be able to withstand heat of 800 or 700 degrees without destortousion. A. We give you know that the relative supparation and the give you know that the relative supparation and the part you know the relative supparation. They are taken in part from Kentie "Mochanical Engineers" Probest Book: "which we send for \$5.00, and in part calculated from other sources. If the number given as relative expansions have four more four places to the left, they will become confident of expansion, giving the amount of expansion for 1 deg. Pairs, pre until of lequit,

Metal.	Relative expansion.	Melting point. Fahrenheit.
Wrought iron.	0.0646	2,740 deg.
	. 0.0685	38,000 "
Nickel	0.0695	2.730 "
Copper	0.0887	1.900 "
Allyer	0.1079	1,742 "
autinimulA	0.1284	1,157 "
Magnetium	0.1407	1.427 "
Zinc	0.1621	779 "
	pt at a tempera	hese metals not to sture of 600 to 70 disture.

(12716) C. D. L. sake: I locours to me that there must be a very decided gyrosopic effect from the rapidly revolving hywhest of an automo-ble motor. Blaced as it untally is directly behind the radiator and parallel theore, what would be the radiator and parallel dresce, what would be setting to man and doubtless to many others; if you would sawwer these questions through the columns of the formers of America, A. The far-posite and the formers of America, and the columns of the formers of America, and and columns of the formers of America, and and columns of the formers of America, and and columns of the formers of America, and the pose, a gyrosoppic effect upon the machine. It is municial value depended upon the weight of the wheel and the speed of its rotation. It is not so great that it is difficult to rates the car. Some great that it is difficult to rates the car. Some

have itseld to account for certain accidence in case way, but we disciple the stempts is a success.

(12717) J. A. B. askir: In the electrolysis of vater, where the poles of the hattery and in vow superists test tubes, filled with and inverted under the company of the company (12717) J. A. B. asks: In the electrolysis



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annufactures with interest and profit is that again construction

80, too, the discussion of fuels is remarks or its enhaustiveness. Not only are she differ inds of fuels that can be employed in auto-sides taken up both from their chemical comp-loss and their mechanical efficiency, but purstars, mixing valves, apray nozzles, makyned

bursters, mixing valves, spray nocales, see Regually thorough are the chapters on ignition, lubrication, clutches and gear sets, etc. Of value to the designer in the chapter on the chassis and its components. A chapter beight to the motorist in the chapter on the chassis and its components. A chapter beight to the motorist bear to contain the components of the chapter of the cha

Braunbecks Sport-Lexikon. Ausgabe, g 1912-1913. Automobilismus, Motor-bootween, Lufffahrt. Herausgeber Gus-tav Braunbeck. Berlin: Verlag Gustav Braunbecks Sport-Lexikon, 1912.

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This is the third annual edition of a work which more or less constant use in this office has proven to be of considerable value. In the presents edition the editor has omitted the older masserial to be found in the previous editions, but has referred to it. In this volume are re-corded all the important events which have alseen place in the world of the automobile, the motor boost, and serial navigation.

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Sending Photographs over a Tele-

phone Wire (Concluded from page 80.)

so designed that they will prevent reflec-tions which might fog the picture. Since the elevations on the gelatin prints on the transmitting cylinder constantly dis place the conducting plate of the rheo-microphone and the current that is sent through the line varies in intensity proportionally to the elevations and depressions of the original gelatin print, the mirror of the oscillograph in the receiving apparatus moves almost constantly. Because of the mirror's movement the pencil of luminous rays reflected is turned from right to left, from the center to the edge of the lens. It encounters the series of screens which reduce its luminous intensity more or less. On the other hand, since the sensitive film has been placed in the right position relatively to the mirror the opening is continually illuminated. Hence when the pencil of rays falls on the center of the lens, the absolute transparency of the interposed screen produces no extinction whatever. The luminous impression is a maximum, corresponding with a black portion on the original print. But if the luminous rays are reflected to the edge of the lens, the absolute opacity of the screen interposed causes a comof the screen interposed causes a com-plete extinction of light and hence white is produced. For all the intermediate positions of the reflected bundle of rays, the scale of screens determines the corresponding halftones and the desired photographic effect is obtained.

By various mechanical means the series of screens can be very exactly graduated and the rotation and sensitivity of the os-cillograph controlled. The image received conforms absolutely with the original. In one of the accompanying illus we reproduce a picture trans mitted over a line 450 miles long.

#### Solution of the Steel Rail Problem

(Concluded from page 525) 1 grade steel were made; they of each forged well and were found satisfactory

	Per Cent
Hoad scrap	6.0
Billet scrap	10
Forge waste	1.8
25 billets	91.2
Total weight, 15,400 lb	100 0%
Total waste	88%
TABLE II. WASTE AND USABL	E PROD
UCT FROM 14 MEDIUM-STE	KI.
INGOTS	

Tota	ıł weig	bt,	15,340	10-	 100 0%
26 bi	llets	• • •			 92.1
	waste				 16
Billet	истар				 07
lead	scrap				 5.6

In conclusion, attention is drawn to the four illustrations at the bottom of page 533, showing the results obtained with an eleven-inch ingot, weighing 1,650 pounds It will be noted that when the tugot had been rolled down into blooms aggregating thirty feet in length, it was necessary to discard only two feet six inches A sec-tion at the inner end of this discard showed only a slight evidence of pipe ection at a point one inch further down the bloom showed absolutely sound material without any sign of pipe.

Now here is a process, which, if it were adopted by American rail manufacturers would enable them to furnish the rail roads with a rail that was absolutely sound and free from the lurking menac of piping. The inventor has found that the decreased cost per ton due mainly to reduced discard is from two to three dol-lars. We believe the present price of rails in the market is about \$28 per ton; rails in the market is about \$28 per ton; and we venture to believe that if the railroads, especially those in the East, where the traffic is heavier and the weather conditions are more trying, could by the payment of slightly more to cover the cost of installing the plant, secure ab-RUBBER Espect Manufactures Field of the Control of





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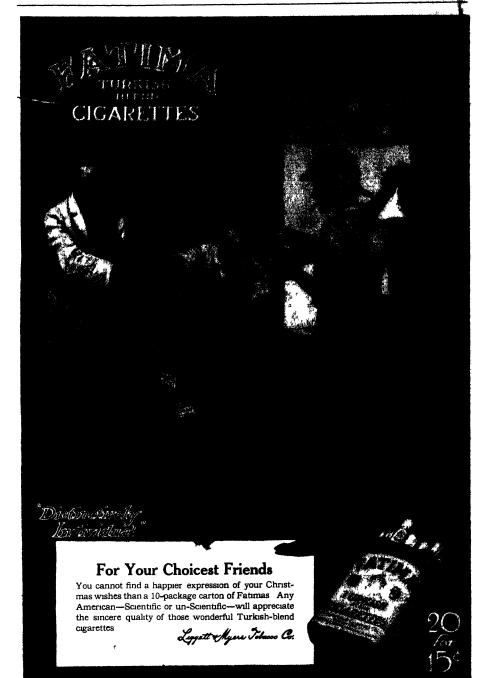
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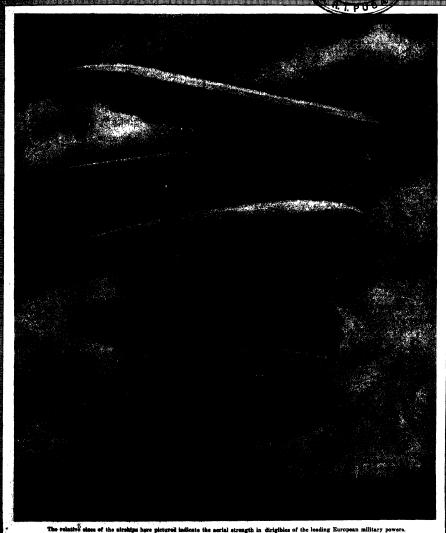
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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION R

NEW YORK, DECEMBER 28, 1912

ME CYL.



THE MILITARY SUPREMACY OF THE AIR.-I.-[See page 550.]

# SCIENTIFIC AMERICAN

Founded 1845 NEW YORK, SATURDAY, DECEMBER 28, 1912 d by Munn & Co., Incorporated. Charles Allen Muon, Pr Prederick Converse Beach Recreatery and Treasurer all at 561 Broadway, New York

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Munn & Co., Inc., 361 Broadway, New York The Editor is always glad to receive for examination illustratives on subjects of timely interest. If the photographs are the articles short, and the facts subtentic, the contribution receive special sitention. Accepted articles will be paid regular space rates

purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

#### The Automatic Railroad Stop

HE propaganda of "Truth" which the New York, New Haven and Hartford Railroad Company is carrying on through its president, Charles S. Mellen, is something unique in the history of railroads Commencing with the letter of Vice-President Mc-Henry in our issue of November 16th, replying to our article of October 26th on the Westport wreck, these Bulletins of truth (or whatever they should rightly be called) by the railroad company, have been continued in the public press in a series of large-type statements headed 'Truth' and numbered consecutively. Acting on the suggestion of the Interstate Commerce Commission that "redirends ought to unitedly experiment with the automatic train stop until a device of practicability of general use shall be available." Mr. Mellen aunounces of general use shall be available. Mr. Meiner aumonices in his third builetin that a reward of \$10,000 will be paid to whoever shall first invent an automatic device that will safely arrest an express steam locomotive that has passed the danger signal.

We congratulate Mr Mellen on being the first prominent railroad official to recede from the altogether un-temble and illogical position which has been held for many years by railroad men, on the question of the automatic stop and other devices designed to take the operation of trains out of the hands of careless em-ployees at the critical moment and automatically safeguard the lives of the passengers. The railroads have claimed that automatic railroad operation induces car lessness, the employees depending upon the automatic devices and ceasing to exercise that vigilance which is required of them. This extraordinary attitude cropped during the Interstate hearing on the Westport dis-er, when the New Haven officials stated that the introduction of easier cross-overs would make matters worse, since they would tempt the engineers to run over them even faster than they were now doing. Mr. Wellen evidently is still of that opinion; for in his "Truth" No 2 he says: "Had the cross-over (10) been a No 20 the result would have been the same"—a statement the fallacy of which any high-school graduate, of average intelligence and with an elementary knowledge of physics, would prove to Mr Mellen's satis-faction in a few minutes time. If "the result would have been the same, 'why in the world is Mr. Mellen giving orders to replace the No. 10 by No. 20 crossovers on his line, as he tells us he has done in the very next paragraph of 'Truth' No. 2?

However, we are greatly encouraged to learn that least one great trunk ratiroad is prepared to install the automatic stop, if one that is practicable under all weather conditions can be designed; for this means that when a home signal, set at danger, says "Stop!" trains will stop, and will wait until the signal arm has trains self stop, and will not until the signal arm has dopped before proceeding into the next block. At present the significent stops, and, by permission of the railroad, is sallowed to advance "cautiously" to find out where the obstruction is. He is expected to do this, without running into the broken rail or the track wrecker's obstruction or the stailed train and so making confusion worse confounded. Sometimes he suc eeds and sometimes there is a collision.

The railroad officials do not like the automatic stop.

They fear that it will "slow down" traffic. They be-lieve that the fundamental principle of safety embodied in the phrase "no two trains in the same block at the same time" is unworkable. They will tell you that They will tell you that the home signal may be at danger because the electric the home signat may be at danger because the electric apparatus governing the automatic action is out of order, and that in this case the train might be held up indefinitely. In answer to this, it is sufficient to say that a simple telephone line extending from the signals

to the dispatcher's office would enable the conductor quickly to ascertain the facts.

That the automatic stop is practicable in every we

that it is safe, accurate and not an interference with that it is sare, accurate and not an intertrensee with the operation of a dense, fast traffic, is proved beyond all disputation by the results obtained on the New York Subway, where the stop has been installed for many years. Signal Engineer J. M. Waldron, of the Interborough Company who operate the subway, tells us he is satisfied that, with slight modifications, the automatic stop as used in the subway could be applied to trunk railroads operated by steam—and surely this

gentleman ought to know.

Let us look at results on the subway, which in regard to the density of traffic, and the small headway of 1 minute 43 seconds under which trains are run, presents the most difficult problem of operation by block signals in the world. Recently, during six days, this system carried 6,505,000 passengers. Of this vast this system carried o,000,000 passengers. On this wast total from T0 to T5 per cent was rushed over the express tracks at speeds of 40 to 50 miles per hour, under the protection of the automatic stop, and of course, of the automatic signal system. The record of signal and automatic stop failures shows that signals have failed once out of 401,115 movements and that the automatic stop has falled once out of 277,846 movements. In other words, there has been one signal failure in about three years and one automatic stop failure in a period of over two years.

Of course this wonderful record is due partly to the fact that the signals and stops operate under ideal weather conditions, being under shelter. For steam road operation some modifications would be necessary; but as the result of an investigation which we have made among signal manufacturers and railroad men who have had wide experience, the conviction is horne home upon us that, if the railroads really wish to install the automatic stop, if they are willing to spend ten times \$10,000 for experimental work that might be required of them or of any individual inventor, and if their eminently qualified staffs will assist in the development of a suitable device, they will not have till 1915 to find the desired mechanism. This \$10,000 till 1015 to find the desired mechanism. This \$10,000 offer will help; but is nothing compared to what the ratiroads themselves might do, if they would take a leaf out of the book of the General Electric Company, whose counsel testified recently in Washington that the company spent several million dollars in experimental work to perfect the Curtis steam turbine

### The Bureau of Chemistry's New Chief

LTHOUGH the coners) nublic knows very lift tle about Dr. Carl Alsberg, his appointment as doubt commend itself to those who are familiar with He is but thirty-five years old, young enough to bring to his task enthusiasm and energy and old enough to exercise the sober judgment and discretion to be expected of a man no longer in his twenties. His academic training is all that can be desired; for be has studied under brilliant professors of chemistry in the leading universities of Germany and the United in the leading iniversities of defining and the United States. Indeed, so far as the mere matter of academic qualifications is concerned, Dr. Alsherg is probably better off than almost any official who has been connected with the Department of Agriculture in late years. The importance of that can hardly be over-estimated. The Bureau of Chemistry needs as its chief a man who has the correct scientific attitude toward the solution of the highly important problems which are assigned to the Bureau of Chemistry Association with teachers on both sides of the Atlantic, who have spent their lives in the search of scientific truth, is the most effective way of securing that attitude. Because of these associations and because of his train-Because of these asse ing, we are convinced that Dr Alsberg's appointment is fortunate for the Bureau and the public. The duties of the new head of the Bureau of Chem-

istry will be peculiarly onerous. Dissensions in the Bureau itself, petty jealousies, a public press which has come to believe that food adulerators, rather than the incompetence of the Bureau of Chemistry Busic, have prevented the efficient administration of the Pure Food and Drugs Act, and lastly, the supervision of the Referee Board, are perils, the braving of which will test the tact, the courage, and the executive ability of the new chief We hope that Dr. Alsberg will perform his new cnet we nope that Dr. Assocra will perform his new functions with such efficiency that it will no longer be necessary to maintain at considerable public expense a Referee Board to check up the work of the Bureau, and that the investigations of the Bureau will henceforth be respected the world over for their scientific trustworthings

### Sea Strength of the Great Navies

F the many published estimates of the rela-tive sea strength of the leading navies of the world, probably none is so accurate as that s issued annually by the Office of Navai Intelligence of the Navy Department. The Navy, through its navel attacker and its navel off throughout the world, has manual facilities, the ering information of the kind, and the sense; is edge of this nature, published under date of Dec 1st, 1912, possesses unusual integracy at a time naval possesses unusual integracy at a time such enormous proportions.

Unless the prognostications of naval strategy tactics have been wrongly made, the fortunes of wafuture naval campaigns will be decided chiefly by t future naval compaigns will be decided chiefly by Tai-modern type of fighting ship known as the drasil-nought. Other things being equal, the nation which can put the largest number of these ships into the figh-ing line will have the command of the sea and sin-prizes of victory secure within her grasp. Let us, their give first attention to the question of the relative strength of the leading navies in ships of the dread-nought type. We include both the lattleships and the large and fast armored cruisers; and since ships are built and commissioned very rapidly in these days, we built and commissioned very rapidly in these days, we will base our comparison upon the combined totals of dreadnoughts, built, building or authorised. We find treatmongant, outside of authorises. We have that England heads the list with 36 such ships, Germany being a strong second with 23, followed by the United States with 13; Russia, 11, Iraly, 5; France, 7; Japan, 7; and Austria, 4. The significant fact for us in this comparison is that Germany, than whom we were stronger a few years ago, will within the next few years have 23 dreadnonghts against our 13. And yet Congress was guilty of the unspeakable folly, this year, of cutting down the modest request of the Nary for two battleships to one. We should build three at very least next year, in order to keep up with our yearly programme

yearny programme
In battleships of the pre-dreadnought class with
mixed armament, the order is England, 40; United
States, 25; Germany, 20; France, 20; Japan, 13; Russia, 8; Italy, 8; Austria, 6. In the destroyer class the
order of strength is, England, 184; Germany, 131; Russia, 107; France, 84; United States, 56; Italy, 35; and Austria, 18. Of submarines England has 86, built, building or authorized; France, 89; United States, 47 Russia, 39; Germany, 32; Italy, 20; Japan, 16; and Anstrie. 13.

When all the vessels now building are completed the relative order of tonnage will be Great Britain, 2.478. 152 tons; Germany, 1,124,307 tons; United States, 898,-435 tons; France, 806,729 tons; Japan, 613,724 tons; Hussin, 450,207 tons; Italy, 416,310 tons; Austria, 289,-701 tons. Here we see that not only has Germany secured a long lead over the United States, but that France will soon be contending with this country for third place.

We are hearing a good deal just now about the group-ing of powers in Europe. Arranging the above figures respectively under the Triple Entente and the Triple Alliance, we find that the Triple Entente will have 64 dreadnoughts, the Triple Alliance 35. The Triple En-tente will have 64 pre-dreadnoughts, the Triple Alliance, 34. The Triple Entente will have 375 destroyers, the Triple Alliance, 184. The total tonnage when all ships now building are completed will be: for the Triple Entente, S.744,688 tons, and for the Triple Alliance, 1,801,-

### Solar Radiation

T is often stated that astronomy has little or no practical value to-day. However much this may seem to apply to some phases of this most interesting line of investigation, it certainly cannot be urged against efforts made to determine the amount and charagainst enter a way a beat and the sum is the same of the sum's heat. Every living thing receives the greater part of its energy from the sun. Atmospheric circulation and climate are dependent upon the same source of heat. If, therefore, it will be possible to find the exact amount of heat we receive from the sun; if we can determine whether or not it varies from day to day, and, if so, according to what law; if we can connect solar radiation with climate and weather, it

would be of untold value to all mankind.

The Smitheonian Institution of Washington has for many years made special studies on solar radiation and easily make first in this regard. Evidence has been brought forward by Prof. C. G. Abbot, director of the physical work of the Institution, that the amount eat radiated by the sun is not constant. With pres of beat radiated by the sun is not constant. With present appliances, however, it has not been possible to determine whether the whole surface is affective in this or not. In order to attack that problem the similaronian inartitution is erecting, at fer station on Monnt Wilson in California, a "lower" telescope, hearty feet high. This instrument will be very studier to the 60-foot tower telescope of the Mount Wilson Singa Observatory, a cut of which will be found on page 156 of our issue for Pétrurary 17th, 1912. The new telescope will also be used in studying the intensety of light Copus the sity and the reflection power of cloud. When completed this instrument will be a powerful.

means of grappling with some of the great problems of solar physics, and in the hands of Frof. About and his assistants we feel sure of its efficient use to this end.

#### Engineering

Steading the Galveston Sea Wall.—The present sea asses of four and one half miles around the city, is to xtended, as a cost of about five milion dollars. It is toted that the extension will provide an elevated protected by see wall, which will accommodate protected by see wall, which will accommodate totally doubte the present population of 41,000.

Panama Canal Excavation.—In spite of a rainfall for month of October of 14.01 inches, the total amount convartion at the Panama Canal resolude 2,568,523 bic yards, which works out at a daily average of 95,738 bic yards for 72 working days. There was piaced in a dam 332,631 ouble yards of fill, and 96,754 ouble yards or converte was laid.

\* Present Status of Panama Canal Work.—According to the canal record, a supplementary estimate of work that must be done to complete the canal was made November 1st,4crom which we learn there has been an increase in excavation since 1908 of over 38,000,000 cubic yards. The present grand total of excavation, estimated, is 211,381,000 cubic yards, and on November 1st there remained to be taken out only \$2,381,100 cubic yards.

New Commander-In-Chief of the Allantic Fleet.— Early in January Rear-Admiral Badger, the future commander-in-chief of the Atlantic Fleet, will relieve Rear-Admiral Osterhaus and will holt his flag on the "Wyoming." This vessel is the latest and most powerful of our dreadnoughts, carrying, as she does, twelve Soculiber, 12-lond guns, mounted in six turres. Her presence in the review recently held in the North River made her familiar to residents of New York and violatity.

A Thirty-five Kast Torpedo Boat.—The British destroyer "Lurchar," during an official see trial of eagle hours, achieved a mean speed of 35.34 knots, or 3.34 knots above the contract speed of 32 knots. The trial, of course, was run in deep water. The "Lurcher" is one of three destroyers 265 feet in length by 25 feet 7 inches in beam. They are driven by twin Parsons turbines, and these vessels will constitute the fastest of their class in the several constitute the fastest of their class in

Oil Engines in the British Navy.—The fact that five different sets of marine oil engines are being constructed for the British navy, show that the Admirally is taking up the question of the bet type of marine oil engine with characteristic thoroughness. One set will be of the Flat type, another will follow the principle of the Nurner type, two of the other sets are to be low-speed engines and the fifth is to be of the high-speed type. In classes the engine will be of the four-stroke cycle, reversible type, and the power will range from 500 up to 5,000 prize horse-power. Various types of sutilizing installation will be tried out. The auxiliaries on one ship will be driven by small-tube steam bolders, and in the other cases compressed air or electricity will be utilized. The resulting data will be of the greatest value.

Electrifying the New Haven Ballroad.—For several years the electrified zone of the New Haven Railroad, cutonding from Woodkawn to Stamford, has been in moestal operation. The company is move engaged in creading the zone as far as New Haven, and it is expected that this section will be open by July 1st, 1913. The new work will embody such improvements as have been suggested by the experience gained in operating the existing stretch of track. One of these will be a rearrangement which will eliminate the effects of electro-magnetic induction on adjacent telegraph and telephone systems, which heretofeor caused much trouble and interruptions in service. It will be remembered that the overhead line carries a presence of 11,000 volts.

Award of Jehn Fritz Medal.—Founded in 1992 in honor of the ironmaster whose name it bears, the John Fritz Medal has been awarded for this year to Capt. Robert W. Hunt of Chougo. The medal is intended to commemorate notable sceneitic and industrial progress. Capt. Hunt, an engineer of world-wide celebrity, served in the Civil War from 1981 to 1895, and has been widely known for his work in many branches of engineering. Previous awards of the medal have been made to Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas A. Edison, Chastes T. Porter, Alfred Nobel, and Sir William White.

Some Figures of Ceal Preduction.—During the year 1910, the total Jocal production of four States, Alabama, Maryhand, Pampiyrania and West Virginia, amounted to 233,050,050 tens. What this means will be understood when it is streed that the total output for the whole United Kingdom In the same year was 264,2500,050 tens. It is streed that the total output for the whole was 768,000,000 tens of the the United Kingdom 235,775,000 tens, for the United States 289,675,000 tens, and for the four States would not be supported by the street of the States 198,675,000 tens, and for the four States would output be streen to 1,185,000,000 tens. The United States 289,675,000 tens, and the the Christopher produces 284,280,000 tens. The United States 501,600,000 tens. The United States 501,600,000 tens. The United States 501,600,000 tens. The United States is nearly one half that of the whole world.

#### Science

Dr. George C. Simpson, late physicist of Capt. Scott's Antarctic expedition, has returned to his regular duties under the Meteorological Department of India, after an absence of three years.

Australian Radium.—According to the London Times, the first sample of radium bromide produced outside of Europe has just been manufactured in Sydney from Australian ores, and has a certified purity of 98.4 per cent. The plant is capable of producing 40 milligrammes weekly.

The Royal Geographical Society is considering the question of admitting women as follows on the same basis as men. The same question was raused in 1883, when the council of the society actually elected a number of lady fellows; but their action was not sustained by a majority of the society, and the controversy that ensued resulted in the resignation of the president.

Metallic Sponges.—A Danish scientist, M. Hannover, has invented a metallic spongo, which has recently come into industrial use. It is composed of an alloy of lead and antimony, and comests of a loose-meshed network inclosing spaces of larger or smaller size. It is employed for absorbing resins, oils, etc. A description was given to the French Academy of Sciences by M. Le Chatelier and is reported in La Revue.

How to Get Bid of the Odor of Linoleum.—La Nature gives the following recipe: Mop the linoleum with a sponge or a piece of old carpet wetted with diluted javelle water (1 to 10). Leave over night, closing all doors and windows; next morning art thoroughly, and over the draed surface pass lightly a mop wet with water containing 10 per cent code bisulphite. Leave again over night with doors and windows closed Next morning wash several times thoroughly with water.

A Magnetic Survey in the Sahara.—The Department of Terrestrial Magnetum of the Carnege Institution of Washington has dispatched two magneticans, Messra. Berky and Sawyer, from Biskra, Algerna, to Timbuktu. They are accompaned by a caravan party, and will spend four or five months in the trp, in the course of which important additions will be made to the great body of magnetic data that the department is gathering from unsettled and moivilified regions of the growth.

The Highest Vacuum Ever Attained Experimentally.—
We talk rather gibily of high vacue, or even of a perfect
vacuum. It is instructive to calculate the number of
noiseules contained in a cubic millimeter of gas at the
lowest pressure on record W. Gaede has recently succeeded in exhausting a vessel to a pressure of two ten
millionths of a millimeter of messury (four one thousand
millionths of a pound per square inch). At this pressure
one cubic millimeter of gas would still contain shout eight
and a half-million molecules—a number equal to nearly
twice the population of New York city.

International Measures Against Plant Diseases.—For some time past the International Institute of Agroulture has been urgang the idea of co-operation among the nations of the world to check the spread of plant diseases. The only approach to concerted and uniform action in this direction at present is that taken under the International Convention against Phylloxers, adopted by certain countries of continental Europe in 1878. At last the first steps have been taken toward bringing about more general co-operation. A notable discussion on this subject was held at the recent Congress of Comparative Pathology, in Paris, the attendance at which included the foremone plant pathologists of Europe. It was finally decided that the French government should undertake the arrangement of an international meeting of plant pathologists in Rome next April, which will, in its turn, draw up recommendations to be submitted to the general assembly of the International Institute of Agroculture, which meets next May.

For Extracting the Principle of Plants.—A new method of obtaining the active principles of plants in the state in which they exist in the fresh plant is used with success by the Preuch scientist, Prof. Perect, of the Paris School of Pharmacy, and together with M. Goris he employs a special method of treating plants for medical use. In this way he obtains extracts of a different nature from what are given in the usual processes where dred plants are employed. Such extracts can be used to great advantage as they contain the active principles of the plant, as more suitable and unaltored form. Thus, by his process, the leading active principles used as alkabids or glucosides and discusses are processed in their complex combinations such as they existed in the cells of the plant, such as they control that their action on the human body is identical with that of the fresh plant. Such combinations are readered stable by treating the sterilling powder of the freshly dried plant by alcohol so as to make an extract. This is then exported in various and than freed from flatty material ways of the freshly dried plant by alcohol so as to make active this process. Such actives or receipt plant.

#### Aeronautica

Garros's New Height Record.—On December 11th Roland Garros made a new height record at Tuns. Algeris, of 5,801 meters (19,331 feet). This new record was made with an 80 horse-power Morane-Saulnur monoplane, which is the same make of machine that was used by Legagnessux when, on December 17th fact, he made a record of 17,880 feat a Villacouble). While Legagnesux required only 55 minutes to reach than height and descend to earth again, farros, in attaining 1,152 feet greater altitude, took one hour, one minute, and as seconds A week later, on December 18th, Garros made a wonderful oversea flight from Tunss across the Mediteranean to Sistly. He covered a distance of 100 miles and landed near Trapin. French torpudo boats were used to guide hour, and he flew at a great height

Omaha to New Orleans by Hydro-acroplane.—On December 18th Antony Janums finally reached New Orleans in his Bounst tractor hydro-acroplane, fitted with a Roberta 75 horse-power two-yele motor. Januas has been nearly two months making the trip, which was accomplished above the Missouria and Missouria med Missouria Palman and Missouria Palman and Missouria part of the distance, which totals over 1,900 miles, be carried a passenger. At the start of his flight Mr Benoist attempted to keep up with him in an automable, but hew was unable to do so. Januas made exhibition flights at various places and demonstrated the opening the start of the proposed of the proposed proposed in the proposed prop

Aeropiane Flights in the Balkan War .-- Almost every s comes from the scene of activities in the Balkan war of flights made by military aviators. The first Bul-garian aviator to lose his life in this war was Lieut. garian aviator to lose his life in this war was Lieut. Tarraxtchieff, who was sent out by Gen Yankoff carly in the war to recompiter Adranople. His monoplane went wrong and he crashed to the ground and was killed as the result of his injuries. The Russian aviator, Poppoff, was also killed as a result of his machine ing fire in the air and falling to the ground, and on De ber 6th Dr. Constantin, the one time assistant of Dr. Doyen, a well-known French surgeon, was shot while making a fight. He managed to descend, and the ma-chine alighted safely at the Bulgarian camp with the dead avastor, who had been shot in the breast, still elutching his control wheel. The barograph showed that he had been up to a height of 4,000 leet. He had flown over a Turkish fort and taken photographis and had evidently been shot in the act. His biplane was riddled with bullets, but this did not seem to affect its flying qualities. Thus once again was demonstrated the necessity of protecting the aviator with armorplate if he is going to engage in active warfare. The only aviator employed by the Turks appears to have been the Frenchman Latort He made several reconnaissances of two to three hour's duration, and brought valuable information to the Turkish commander A breakdown to his engine caused him to alight behind the Greek lines and he was captured. The latest cable news is to the effect that on the 19th inst. a Greek aviator, Montoussis, and his passenger dropped many bombs upon the fortified town of Janina, seriously damaging the principal buildings and terrorizing the inhabitants

Recent Aeropiane Fatalities in England and America.
On the 15th mat two double aeroplane fatalities occurred in England and the United States. Lieut.
Parke, R.N., was currying a Mr. Hardwek as passenger in his Handlevs-Page monoplane and flying from Hendron to Oxford Helet the aeroctrome at noon and was traveling 50 miles an hour in a choppy wind at a height of some 300 feet when the monoplane suidenly down to the ground, killing both aviator and passenger metantly Leit. Parke was an excellent aviator and had done considerable cross-country flying. Some months ago he faced certain death in a spiral diver from which the mirraculously escaped by making what had heretofore been thought to be exactly the wrong maneuver. The American fatalities occurred with a hydro-servipane in which avance Hornec Keartew and a movapour experience in which Angeles to San Francesco This flight was started over the Pacific Cosean, which had been agitated for three days by a 30-mile gale. Aviator Glenn M. Martin, while searching for Kearney, was nearly drowned also by landing in the rough sea whoch is motor ground. The bodies of the two men were finally found nie miles from the starting point. Stopping of the motor and a descent in to couple as who the started solved the recognition of devenued its occupants. Ther fats should be a lesson to all aviators not to attempt foothardy flights.

The Sing Sing Motor Dumping Truck

EVER since he has been associated with the Depart-ment of Street Cleaning of the city of New York, Commissioner Edwards has endeavored to introduce improved methods of collecting ashes, garbage and other refuse. It was apparent to him that the system of using small ash carts with a capacity of a single

cubic yard each was not very economical.

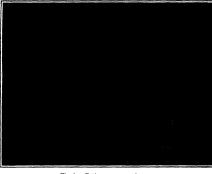
As a result of very careful tests it was proved that the most economical unit was a truck that would carry nine cubic yards The Commissioner has also endeavored to displace horses with motor trucks, and experiments this summer proved conthat the motor truck offers material advantages over the horse-drawn vehicle in the matter of time and money.

About two years ago the Commissioner visited the State prison at Sing Sing, where there is a shop in which steel dump-carts are constructed by the pris-He suggested to the Superintendent of Industry that the Street Cleaning Department of New York needed a mo-tor-driven truck of large capacity, and forthwith the task of building such a truck was undertaken at the prison. The difficulty of this task will be realized when it is known that the 18 or 20 men employed in that shop had never men employed in that soop and never worked on an automobile before and knew nothing about machiner; except what they had bearned in the course of their labors in the prison Previous to their imprisonment they had been bakers, bartenders, longshoremen, sallors and laborers The Department of Street Cleaning informs us that the men took a great interest in the new machine and entered into the work with enthusiasm. Any literature that they could get hold of on the subject of automobiles and their construction was read with avidity, and they spent their leisure hours studying the plans and endeavoring to solve vari-ous problems of design. One man, who became ill during the construction of the machine, sent suggestions from his is in the hospital, and, when dying, said that he would be satisfied if he could live to see the finished truck and ride in it once around the yard.

The machine has only just been completed and may now be seen on the streets of New York, where it is under going a rigid test. The truck is constructsteel and has a body with a capac five cubic yards However, there

ity of five cubic yards. However, there is a wooden cover over the body which may be piled up with two or three cubic yards more. The particular advantage of the truck is that the body is hung very low, so that it may read ily be loaded. To save time, the truck need not be stopped while being loaded, but may travel slowly forward at the rate of a slow walk while the cans are being dumped in it. A novel dumping gear is provided consisting of a worm and sector. The dumping gear is driven by the truck engine through a clutch mechanoperated by the driver By reversing the gear, the body is returned to its normal position. The cover body is returned to its normal position. The civer over the body is provided with a number of doors, so that the load may readily be distributed. Only one of the doors can be opened at a time, so that the dust is confined within the body. This is a great advantage over the curts heretofore used, which have been either open or partly open, and the resultant dust when load-

ing was very annoying to passers-by. At the rear of the cover is a door which opens automatically when the hody is tilted to the dumping position. The dumping gear moves the body to an almost vertical position, which is possible because the fulcrum is placed back of the rear axle. The operation of dumning is completely automatic. The entire machine is very staunchly built



The insuffiction apparatus in use.



Dr. Janeway's insufflation apparatus.

and the mechanism is practically "fool-proof." So far the tests of this machine have been very satisfactory, and it is quite probable that the city will profit mate rially from the devoted industry of the convicts

#### Dr. Janeway's Insufflation Apparatus By John B. Huber, M.D.

S OME time ago we considered "cloudland surg-ery," such as Dr. Willy Meyer does in an apparatus devised and perfected by him and his brother—the latter a mechanical engineer. This apparatus is espeinter a mechanical engineer. This apparatus to especially appropriate when operations within the chear are to be done. Until the elaboration of some such apparatus, the thorax has been about the last region the body uninvaded by the surgeon. The res

is that when this cavity was entered, the t resilient pulmonary tissue, no longer prot et wall from the normal air po teen pounds to the square inch, must me so that respiration becomes impossible and death The apparatus of the Meyers com ervenes. chamber in which the atmosphere is so ran

that a negative (-) air pressure re about equivalent to the atmosp breathed at an altitude of 1,800 feet a brearing at an attitude of 1,000 last. Last this legative pressure chamber is a puttive (+) pressure chamber in which atmosphere is denser than that ordinar obtaining, and which accommodates o enthetizer and the head of th tient—the latter's neck being guillotiness by a rubber ring, while the rest of his body is in the "negative" chamber. Thus the possibility of lung collapse is still more obviated, the negative pressure un the torso in the larger chamber being still further counter-balanced by the plus pressure air which the patient's mouth and strils are breathing in chamber.

Here is one mode of fortifying the lung against collapse in intrathoragic operations; another method, that of intratraal insuffation, may be described as follows: Ordinary breathing consists of alternating respiratory movements; aeration of the lungs therefore depends (among other factors space does not per mit detailing) upon the intact condition of the chest cavity During inspiration the circumambient air reaches the smaller bronchi, where the exchange of oxygen and carbonic acid, etc., is effected in the pulmonary "air alveoli" in obedience to the physical law of the diffusion of gases. That superb scientist, Dr. Samuel J. Meltzer, discovered how "the ventilation of the alveolar air can be accomplished through a continuous stream of air pass-ing in one direction instead of the double movements (of inspiration and expira-tion) in opposite directions." In making tion) in opposite directions." some experiments on the mechanism of breathing in the positive pressure apparatus of Brauer, Meltzer and his colleague, Auer, found that if they passed a tube through the larynx of a dog down the traches (the windpine) almost to the bronchial bifurcation, and blew air through this tube in a continuous stream. the animal could be kept alive for many hours, even after all voluntary respiratory movement has been paralyzed by curare. By allowing the stream of sir

(preferably warmed, as we shall see) to pass over the surface of ether in a bottle, they were able to anæsthetize the animals very satisfactorily; and it was possible to open both sides of the thorax widely (the lung remaining uncollapsed) and to have the animals remaining alive for any number of hours. The lungs meanwhile remained moderately distended, the heart action good and regular, and everything as good and comfortable as any self-abnegating canine might desire. The air and ether mixture was blown in at a prossure

of 15 to 20 millimeters of mercury. The only conditions essential to success were that the tube must be of a diameter less than one half that of the glottis (the upper opening of the windpipe), so that the stream of air and ether which man

(Concluded on page 859.)







Tilting the body to the vertical dumping a

# Is a Forest a Storage Reservoir or a Stream Regulator?

## Effect of Forest Land on Navigable Streams

By Guy Elliott Mitchell, United States Geological Survey

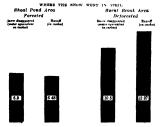
THE United Natice Gological Survey has announced the results of an exhaustive investigation covering a period of twelve months, which disposes of a prolom which has long been a source of contention announced the content of the cont

The Geological Survey, after more than a year of field investigations under the Weeks Forest Reservation Act, has faully reported on at least two distinct classes of forest lands, under which must be included a large projection of our forests, to the effect that the forest and the forest ground cover are important factors in the regulation of stream flow. The Weeks Act in brief provides that forest land

The Weeks Act in brief provides that forest land which can be shown to exert an appreciable effect upon navigable streams may be purchased by the Government and created into forest reserves or national forests. The duty of determining this relation between the forests and the navigable streams is placed by the law upon the Geological Survey Considered for law upon the Geological Survey Considered for Such as act of government was devlared by the Judiciary Committee of the House of Representatives some five years ago, to be unconstitutional. Upon make a fivorable showing on any and every tract of land prior to consideration of its purchase. The Director of the Geological Survey to land prior to consideration of its purchase. The Director of the Geological Survey beld that his report in each case must be based on actual field examination and the presentation of steartific data in support of his

report. The Nouthern Appalachian Mountain forests were first selected as presenting the most promising field, prompt action being required, since the appropriation was made in terms of fiscal years, \$1,000,000 for the first year and \$2,000,000 annually for the succeeding five years, these amounts, unless expended, lapding with each July 1st Utilizing what geological and stream flow data were available, field parties were immediately started out, and during the four remain-

ing months of the fleest year from the pussage of the fact in March, 1911, several large tracts of mountain forest land in the Southern Appalachian States were favorably reported on, based squarely upon the principle of protection of martisable streams from the products of excessive erosion due to deforestation and repeated burning of the forest must or mulcic. The tilt and detritus, it was clearly shown, resulting from each forest treatment are washed down into the tribusing the forest treatment are washed down into the tribusing the state of t



Comparison of two areas for three storm periods (17 days) in April, 1912.

6 48 Inches

A. Amount of snow disappeared, expressed in water equivalent, during three storms in April, 1912, on the forested Shoal Pond area B. Biunoff of Shoal Pond proof sumperiods and same area C. Nimilar snow disappearance on the deforested Burnt Brook area. D. Runoff of Burnt Brook, same periods and same area

taries and from them find their way into the lower payigable rivers and clog them

In the White Mountain region, however, physical conditions were found to be different. Geologic havest agation could find no basis for the statement that de forestation of the granite slopes of the White Mountains would endanger the makinghility of the Merrimac, the Kennebec, or the other navigable rivers of New England Geological Survey officials along with the undorfty of conservationists and nature lovers might believe that the protection of the White Mountain forests would stendy the flow of the streams rising there in, but they could state their belief only as a matter of opinion. This was not sufficient under the law. If its proclasions were to be carried out both in the Interests of the proper expenditure of the Government money which it appropriated, as well as with a clear to considering even this large appropriation as only the beginning of a broad governmental policy for the acquirement of great tracts of lind in all parts of the United States where mytgable rivers head, there could be but one method of procedure to show beyond question a direct and important relationship between forest cover and stream flow.

Failing, therefore, to find any excessive eroson in the Water Monattus, due to deforesention, the Surveyer distributed by drometric investigations in an endouvour to show that deforedation, and subsequent burningside of the vegetal forest mulch, does result in a more rapidable the flower of the vegetal forest mulch, does result in a more rapidable the flower of streams. In this it has been successful even beyond

The hydrometric showing presented in the Survey's preliminary report is of results on two small, almost exactly similar, drainage basins on the east branch of the Pemigewasset River of about 5 square miles each. one largely clothed with virgin timber and the other detorested and burned, and is so striking as to render the position of the Survey impregnable. Careful measurements of precipitation over the areas and of the runoff of the respective streams show that not only was the snow held better in the forested area, but that during a period of 17 days in April, 1912, including three extended storms, the runoff in the stream in the deforested area was a comparative flood---practically double that of the stream flowing through the forested area. In Shoai Pond basin (the forested area) the Survey had established seven rain gages and twenty snow gages, the engineers visiting these continually during the whiter on snow shoes the snow being from 4 to 7 feet deep in the adjoining Burnt Brook basin (the deforested area) it established nine rain gages and eighteen snow gages. On both streams hydro-metric stations were established and the stream flows determined with a high degree of accuracy. The stream discharge from the deforested basin was double that from the forested basin, and the maximum flood from the forested basin was only 67 per cent of that from the deforested basin

During the period of these storms, Burnt Brook (deforested) is shown by the report to have contributed a much greater volume of water to the Penngewasset



Typical method of toe measurement in the White Mountains. The results of the present actual measurements in the drainage basins of this district, so accurate and refined in method as to approach laboratory experiments where exact effects may be expected, leave no doubt as to regulating stream flow.



One of forty observation stations visited weekly during winter for determining depth of snow and its water equivalent, the latter being found by weighing a sample of snow. Four observers were kept busy on this work in snow up to 7 feet deep, often in high winds and below zero.

River than did Shoel Pond Brook (forested). "The stream of the forested basin is observed to be the steadier of the two, and in proportion to its drainage area it tends—at least during the spring months—to promote a steady flow of water in the master stream of which it is a rithuitary."

which it is a tributary."

The conclusions of Director George Otis Smith of the Survey are as follows:

"The comparison between two adjacent basins during critical periods is presented in this preliminary statement as a sufficient showing for the purposes of the National Forest Beservation Commission. While data covering longer periods for both these and other basins in the White Mountains have been collected and will be available for the more complete report, the particular case of the Burnt Brook and Shoal Fond basins is typical for the region and establishes the general conclusion that a direct relation exists between forest cover and stream regulation.

"The results of the Burnt Brook-shoal Pond Brook studies are held to show that throughout the White Muuntains the removal of forest growth must be expected to decrease the natural steadieses of dependent streams during the spring months at least. The foregoing conclusion forms a strong basis for arguing the desirability of paintstaking methods of administration in respect to forest lands in the White Muuntain region. Beforestainto followed by fives, as in the Burnt Brook

basin, receils in conditions intelevenable to institute pring storage because condendive to rapid storage because of pring storage because of the storage of the storage and storage and storage and storage of the stor

any ancex aream requestion to use aware quantitatively indicated in the comperison of the forested Sheal Pond Brock with the datorested Barrier Shook.

While the intensive hydronestria work was confined to a few headwater tributaries of the Connectivet and Merriman cirvers, the beains studied were selected as typical for the whole White Mountain area, and the Seid examinations over this region have shown the tracts now under consideration for purchase to be similar to the beasing here reported upon. Therefore, the throughle showing of this report is of general application in the White Mountain area."

Buch an actual demonstration and quantitative meaure of the performance of different areas, some forcited and other adforested, has never been attempted in trying to determine the effect of forcet cover on stream flow. Biforts to arrive at definite conclusions have always been attempted on a basis of a study of long-time records of precipitation and stream discharge; but owing to the many qualifying factors, these have simply resulted in divergent opinious and inconThe second secon

regions. While the report made by the florrey befirst specific and while the report made by the florrey befirst specific cally to two small distance hadnes and while the earlier while flowed are that the earlier While flowed area is explicit to perchase under the Weeks law invertibles a large amount of additionally what has been carried on in the White Momentan and many side is the completed. As none as finished, a final report will lie interest the two the completed as none as finished, a final report will lie invertible in the large flower will lie facts in full and also discuss the problem from a self-set estangent. It is ballward that this will essential a fact which the section. It is ballward that this will essential a fact which has been accepted bettered, and advocated by many promothent men for many years, yell which upon the challenge of equally emissent men, they have never been able to prove.

# The Military Supremacy of the Air-I

The Aeronautic Plans of Great Military Powers

By Theodore M. R. von Kéler

ASTRUGOLE has begun on the European continent at the military control of the air. No longer a phantasy of the novelbet, or a drawm of the liventor, the fight for mastery is being waged under the very eyes of wondering Europe The (wo combatants, needless to say, are France and Germany; and how far this struggle already has been carried, how many full-lones of dollars it already has been derived by the many full-lone of dollars it already has cost, and will cost in the near future, this article will show.

the hear future, this article will show. The German Relebatag in the last week of May, 1912, passed by an overwhelming majority the army 1912, passed by an overwhelming majority the army 1912, passed by an overwhelming majority the army 1912, and navy bill, with its provision of \$30,000,000 for "extraordinary exposes." The hill contained a "rider" in the form of an appropriation of \$50,000,000 for the development of military accoplanes. Small as this appropriation is, il served to electrify France and stir its military leaders into extraordinary activity. The very fact that the methodical, slow Teuton considered it necessary, or at least worth while, to set adde half a million dollars for the "development of accoplanes," in addition to maintaining lange air-ships of the Paraeval and Zoppella types, showed more than anything else Germany's determination not to permit France to sujly any longer its hitherto unchallenged supremacy in serial navigation.

Other nations were not slow in recogniting the prob-

Other nations were not slow in recogniting the probability of having to fight at least part of their battles in the sir, and a feverish activity in the launching of fighting air criff became evident soon after the publication of the French and German budgets. Early this summer the international serial fleet, exclusive of heavier-thin-air machines, consisted of sixty-dwe crusters. Of these, Germany owned temuty; France, stxtees; Russia, nine; Italy, seven; Austria, four; Geraf British, three; Beighum and Japan, such two; and Holland and Spalin, each one. Five of the twenty aircruitsers under the German flag are of the trigid type, six are semi-rigid and nine are non-rigid. Aside from these the Knizer's government has in course of construction two additional rigid atrialps (Zeppelin type), three semi-rigid of three different types and one non-rigid (Parseval type).

A comparison of the sizes of the various sirehips in the international fieet shows that the small latest is the "Dundigt" of Holland, which has a capacity of 950 cube meters of gaz; while the largest is the German "X.1. It" (sjebittie-Lanz), which is of 19,500 cube meters, capacity, and which has a lifting power of 22,000 kilogrammes. The Zeppelina are by far the fastest serial crusieers, possessing a speed of seventyfive fret per second, while the fastest French ships so far have only been able to make fifty-frow feet per set and, long-distance flights in each case being figured as a basis for the calculation. The new German nava-Zeppelin, too, holds the endorrance record of over 31 hours in the air, during the course of which it covered 1,200 miles and broke the record of the "Adjutant Rean"

1,230 mines and rose the record the Adjutant Acad of 21 hours, 21 minutes and 569% miles made a year ago. Early this spring the French Ministry of War asked Parliament for 18,116,540 france for acrial navigation. Enormous as this sum appears, it was soon discovered that it was entirely inadequate for the needs of France Instead of curtailing the minister's demands, the Seate suggested a considerable increase in the "scrial" programme, and a total of 33.231,280 france are granted for this purpose. In addition, the Ministry of War obtained permission to extend its programme and its demands. The new French law reorsuiting the "FIRA Arm" went into effect on March

Aerial navigation being so little understood and devaloped at present, it is but natural that no definite rules and regulations worked out into the minutest details have as yet teen adopted. The new law is serverly a embination of the chief tundamental principles untering this sort of cervice. Its most important effect is the segregating of the serial troops from the rulway and engineering corps, as well as from the artilery regiments, with which they heretofore has retulent to the command of an imprector of aeronautics, who is directcombined. The entire organization will be under the

ly responsible to the Minister of Wer.

Military accounties, according to tits new French
law, comprises not only flying in its ordinary seesabut also the study, construction, purchase and operation of spherical, elongated and dirightle balloons, observation sites, acceptance and hydro-acceptance, and
the instruction and mobilisation of aviators, accepance
and observors. The law distinctly provides for the
purchase of all military acroplanes, etc., from private
manufacturers in the open market, but permit of all
repetra being made in the government shops. The Mes,
field as acroplane manufacture brings better results
than government work along established lines. Repairs, on the other hand, can be carried out more sidvantageously in the government shops, where labor
is almost free and where expert mechanics are at all
times available.

The new French "Fifth Arm" is organised as follows:

Seven companies (each of 3 officers and 308 men) and one transportation company (constiting of 5 officers, 127 men and 133 borses) form the serial regiments. In addition there are 10 "sections" of 60 men such, which will take care of the actual frigns. A separate staff of mechanics is to be selected from the best soldiers to carry out the necessary require and to work out improvements in construction.

to work out improvements in construction.

A provision is furthermore made for a continuous transfer of men from other arms of the service to the serial corps, so as to diffuse the knowledge of serial work as much as possible enough the rest of the army. This precaution was thought necessary on account of the work depret and streamments of the work.

work as much as possible smong the rest of the arrival relations was thought necessary on account of the extreme danger and strengousness of the work, which few are able to endure for more than three years. The serial corps is open to all persons who have graduated from the Ecole superbieure d'accondique in Paris or who have obtained a pilot's license from the military authorities; furthermore, members of serociubs and pupils of private aviation schools, who can pass an examination as to their abilities, as well as mechanicians and workmen who have been employed in scroplane factories, changiers, etc. All these may be drasted in the regular way, as are recruits for other paris of the army.

mechanicians and workmen who have been employed in acroplane factories, changiers, etc. All these may be drafted in the requiar way, as are recruits for other parts of the army. Volusteers are welcomed from other walks of life, but all of them must pass a particularly rigid examination as to their health. Perfect eyesight, good lange, a good kinwhedge of gasoline engines and wireless telegraphy are essential. Only officers will be graduated as gibtos of single-sented aeropianes, petty officers and men being restricted to the postician or pict of aeropianes with more than one passenger. Officers, whose duty it is to familiariss themselves with the work of the aeropiane copes, such as mambers of the general staff, artillery, etc., are taken on board the aeropianes cape, are taken on board the aeropiane cape observers.

(To be continued in next week's issue.)

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The influence are not respinished by abstracting the first restriction demonstration. Associations common to considered, but the names of respinished upon the control of the first and the first but the first but the control.

#### The Proceed Canal Absurdity

The Preschil Canal Alumnity
the Better of the Scurreiro Anentoan:

\*\*Weithing segme strange that we Assertane, after
seasing, 500,000,000 in making the Panama Canapasity—for within the next ten years that amount
lander will have been paid out from the U. S. Treasjen segment of the canal—are so simple-standed
and so unbestnessities as to allow, year after year in
the feture, untel millions to go into the pockets of
teamship owners rather than back into our own

"season".

ed that all this money that the c it is ub American counting vessels should pay to the Ameri ers; just so much more in dividends to divide ng the stockholders.

sisting the stockholders.
Air we concurring American shipping by allowing finishing counting vessels free passage through the signal? It she great and glorious American mercantile picture service to be revived and given new and ending prospectively securing the payment of a toll of this sind! Not a bit of it!

e men who control the various steamship lin "The sean who control the various steamship lines, and others who are planning to operate new lines and sinks use of the canal, are all prepared and ready to say a toll for the passage of their vessels through the canal. If it should be decided to-morroy to make all insistenton vessels pay to pass through the canal, it would not change the plans of the existing companies, or of the individuals who are planning to enter the business in competition with existing lines, one particle. The entire trade will be in the hands of a few corporations. If they and their stockholders have to war a few the corporations. pay a toll to the American Government, as, of course they should, it means so much less profit per aunum to them, less cash to divide among the combine, but it them, sees cash to divide among the commine, but it also means that the American people have got fust that same amount of money paid into the U. S. Treas-ury, and not into the pockets of a comparatively few already wealthy individuals.

The idea of the American nation spending \$500,000,-000 and letting the steamship companies cripple the earning power of the canal, and putting those tolls into their private pockets instead of benefiting the entire country by paying these sums into the U. S. Treasury, is simply monstrous! What benefit is the American nation getting by allowing millions of dollars in tolls to go into the pockets of a few millionaires? As a result of free passage through the canal, are these steamship corporations going to make a reduction in scenmany corporateons going to make a reduction in freight rates? Well, hardly. As a result of this elim-ination of tolls, do we hope to induce the men in the steamship business to use the canal? Are we afraid that a toll will scare them off? Is it a kind of national ly or encouragement for Americans to invest in the shipping busin se? No! Everybody who has oc the shipping business? No! Everybody who has occa-alon to use the canal is going to use it, toil or no toil, and the payment of a proper toil is not going to cause thinks to fail, or go out of business, or discourage them thinks befilting new ships. Is it supposed to be particu-lish, or just pure generosity, or what in the name of reason is it, that makes certain individuals at Washington and various newspapers declare that millions of deliars that should by right be added to the national aith every year, had better be turned over to swell fortunes of a few individuals?

the fortunes of a few individuals? It certainly would be an editing sight to stand on the bank of the canal and watch ship after ship, some going must shad some going work, all owned by American corporations in coast trade (and manned monthy by foreigners) passing through free of exposses. A good half billion dollars spont by the U. S. Government, the coast not be edited with free ships; and \$6,000,000 or after Americans wondering why the few comporations that own these ships should be allowed such an unjust privilege! Is that a businessilke way

sees as enjoyer prices is a text a numberature way to run any enterprise? How are expenses to be just? \$0, that's sary. There is givery more memory in the Treasury, and then we will near foreign-owned ships, and Tankees as will be the seed of the same of the transverse with other consistents. Their sature large sarged in benuescen with other consistents. Their sature large sarged in benuescen with other consistents. Their sature large sarged in benuescen with other consistents. Their sature large sarged in benuescen with other consistents. Their sature is and you between the sature is the sature of the sature of the sature of their sature is of their sature in the sature is the sature of the sature of the sature is the sature of the sature of their sature is the sature of their sature of the sature of t run any enterprise? How are expenses to be me

orn from all civilised nations. To reply to England that the canal was built with American money and is ours, and that we shall do what we like with it, is childish in the extreme h in the extreme.

As it looks now, we shall not do as we like with it. As it some now, we shall not do as we like with it. Far from it; for the great benefit will accrue to a few corporations only. It is impossible to conceive that any such absurd proposition should continue in force very long. If this free-from-toil scheme for coasting els is allowed, there will be a great howl later on, a sil the people begin to realize that they have been fooled. Now is the time to save ourselves from becoming more ridiculous than we already are.

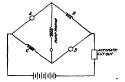
During the past few years our moral perspective and case of obligation seem to have become rather twisted and out of line; in fact, from the very beginning of this canal business; and he who has shouted himself boarse about "fair play" and "a square deal for everybody" has publicly boasted about the part he played in buncoing Colombia out of Panama. We have refused coing Colombia out of Panama. buncoing Colombia out of Panama. We have refused to entertain Colombia's plea for arbitration, because we know she is a weak nation and helpless to enforce her rights. Let us hope, however, that the coming administration will acknowledge the men frick that was played on a sister republic, and that she will rewas payed on a sister republic, and that she will re-ceive proper reparation. Those who attempt to defend the attitude that we have taken toward Colombia give as an excuse that "we got the canal, anyway." Let me say, and overyone who understands the situation at that time will agree with me, that we would have had it just the same by adopting fair and honorable means. Let us beware how we treat England in this present dispute, for she can humiliate us, while poor H. M. W

Newton Center. Mass.

## Farm Electric Lighting by Wind Power

To the Editor of the SCIENTIFIC AMERICAN:
The article on "Farm Electric Lighting by Wind " in the SCIENTIFIC AMERICAN for September 28th od one. Having had a few years experience with a is a good one. what similar plant, perhaps it may be of interest to

My own plant is of even smaller canacity than My



A pump in the windmill power circuit. A and B com-mutators, and C and D field windings of dynamo.

rest's, but that is due mainly to the expense involv Forest; but that is due mainly to the expense involved. I have tried many experiments in attempting to find a satisfactory way of charging batteries: among others I have tried that of putting the batteries in series with a motor used to drive a pump, so that the windmill had to motor used to drive a pump, so that the windmill had to murab power to run the pump as well as to obaspe the batteries at the same time. While this arrangement rurans power to run the pump as weil as to charge the batteries at the same time. While this arrangement worked well enough to permit of charging several home-made cells for the first time—which, of course, required many hours of charging—yet the experiment of rewind-ing the dynamo, so as to charge the batteries without hav-

ing the pump intoor in circuit, was made.

The result of this change was a decided speeding up of the windmill, but on the whole it was a great improvement, as the system required less attention. Oiling is about all that is necessary.

necessary. Ian of using a quarter-turn belt from Mr. Forest's pi windmill to dynamo looks good, as it should reduce both noise and friction. While at this season of the year there is often more power than one can satisfactorily take care of with such a plant, there are times when such improvements as a ball bearing at the foot of the vertical shaf

ments as a ball bearing at the foot of the vertical shaft, and a pated utdrevend joints near the top of that shaft to take ears of the slight bend which would otherwise be made by the weight of the tail of the windmill. will show a surprising difference in the speed of the windmill. As to thing two pulleys, to allow for variations in the speed of the wind, my experience has been that at times when the wind, my experience has been that at times when the wind velocity is low, and a large pulley is accordingly being used on the windmill, there is sometimes a gental wind of short duration which is severe enough to mead the arrigington up and make the wires burst from the a guest, a want of short curration without is severe strong the speed the artistate up and nake the wires burst from the slots. Since re-winding the armsture several times, I have wedged the wires in, and use only the smaller of two pullary on the windmill. Even now the speed is at times smough to make one fear for the armsture winding.

sateign to many one rear for the arms one when an Mr. Friendy is plant does not include a pump; there are some difficulties in belting a pump to a power windmill, for if general so as to pump with efficiency in light winds, spead and noise will probably be excessive in heavy ones. The diagram shows a mathod of avoiding excessive

speed of a pump without cutting down its efficiency at speed of a pump windout cutting down its emocency at low speeds of the windmill. After the pump reaches a certain speed, charging current passes into the batteries. Both the pump's speed and charging current are automatically limited, without the use of mechanism likely to get out of order. If the field windings C and D are of istance, and if automatic cutout is efficient, the will be no danger of the motor's speeding up to bursting point if the belt slips.

I have tried an experiment which leads me to think that the above scheme is as good in practice as it looks in theory. Of course, the windmill may speed up consider-ably in very high winds, as the load on it is limited, but it aby in very high winds, as the load on it is limited, but it will not speed up quite so much with a heavy load as it would with a light one. Of course, if it were not for the expense, it might be better to increase the load by in-creasing the size of the battery. In this case, an ordinary shunt-wound motor might be used to drive the pump. ent being taken from the battery.

In the article referred to, something was said about eversing the polarity of the dynamo. It would seem that this ought to be impossible; certainly some systems are such that a reverse current from the battery would only strengthen the dynamo field.

As I remember it, you published an article on German windmills for charging storage batteries some years ago. Judging from the illustrations, excessive speed was pre-vented by dividing the blades of the windwheel into secvented by dividing the manuscus in the minuscus into a tions, which were connected together and operated like the shutters of a window blind. Presumably, when the speed reached a certain limit, centrugal force caused the "shutters" to open and let the wind pass through. Just how satisfactorily this worked was not stated; if no better than some other windmills, the windmill would stop entirely after the automatic speed limit came into play. Then it would gradually speed up to a considerable speed, thron stop entirely, etc. EDWARD A. FINCH

Sound Beach, Conn.

#### The Gift to the City of Evansville

To the Editor of the SCIENTIFIC AMERICAN: In your issue of December 7th, page 480, under heading of "A Curlous Gift to the City of Evansville," there is a typographical error that might cause some confusion. It is stated that \$1,000 placed at 4 per cent interest per annum, compounded semi-annually, in 250 years would aggregate \$90,956,400 13. It should be \$19,956,400 13. The calculations in this transaction were made by Mr. C. L. Delbridge, the St. Louis mathematician, for the parties to this contract. I have taiked with him many times about it, and herewith inclose a booklet in regard to same, issued by the cor for whom he is the official mathematician, in which

the amount is given as \$19,956,400 13. W. F. COLLINS.

#### Landing Aeroplanes from Warships

To the Editor of the SCIENTIFIC AMERICAN The daily papers of November 13th, 1912, describe a coessful test of a launcher for flying machines which

took place at the Washington navy yard on the 12th.

All who are interested in the improvement of the aeroplane may well congratulate themselves that the subject of launching, which has so far received comparatively little attention, is now coming to the front.

It is now recognized by the authorities that, if the aero-ane is to be used for naval scouting, it must be able to take flight not only from the water but also, under some conditions, from the very restricted area which can be spared on a ship's deck.

Various forms of launchers have been invented. The first successfully used was the "tower, weight and tackle," familiar to all who witnessed the earlier flights of the

Among other inventions are launchers using (a) the among other inventions are nationers using (a) the energy of compressed air, (b) atmospheric pressure acting in a vacuum tube, and (c) an endless cable which is a much abbreviated form of the cable formerly used on street railways.

From what has been written upon the subject by the naval authorities, it may be gathered that, in a laun apparatus, the navy needs one which will in no way be a apparatus, the navy hoses one which with in the way to a numanne when a ship is in action. The number of parts should be as few as possible, the apparatus must be one which can be quickly taken apart and stowed in a small

It seems probable that as time goes on, naval architects will be working in co-operation with the inventors of aviation apparatus. When it is considered that in the dem ship of war nearly every space is already utilized, would seem that in moments of stress any aviation

appearates may prove to be an intruder.

If it be the opinion of navel architects that in a battle or in the preparation for battle, when the order comes to "Clear decks for action" sviation apparatus will be a nuisance, it will be a gain if they will say so That will hasten the time when one of our older ships of moderate size may be devoted exclusively to aviation, serving as a ent ship for aeroplanes. JAMES MEANS



Otter returning to the surface with its prey



Arrangement of observation chambers designed for a



Contrivance for photographing with the operator above when the water is disturbed



I hotographing fish in tank with light from two sides.

# Aquatic Life in Its Own Setting

A New and Fascinating Territory Opened to Nature-students

A PPARATUS lite those deriend by Dr. Francis Ward an Engiths student of sollingy suggests some quaint reflections on the methods which mankind has been following for countiess generations in studying the appearance and movement of these and squade-clusions on the shape color and movement of these and squade-clusions on the shape color and movement of home or of sheep solely upon our observation of the decremed corpses of such quadrupode. A fish out of water is not himself no matter if he settll gasping on the bank freshly hooked his color for reasons which Dr. Werdt burdly explaints as a constantly varying function of his immediate surroundings the pose of such size of the study of the state of the study of the state of the

biological study. For the aquatic form of camera sport, it was first necessary that a highly specialized apparatus should be constructed. First, In Ward had a pond made, in which he arranged, for the subject of his study conditions exactly like those to which they would be access tomed in any jece of water where they night naturally be found. But all the sides of this pond are built of concrete and in one wall, as he describes it in his fairway of Fish 1 fit as Reveised by the Camera (Camera & G. Lintadel) is an observation chamber that the compact of the control of the decision of the control of the decision in the chamber in the chamber and the light in the pond the glass is converted into a mirror and the fish nerely sees thused in and the surroundings reflected, while the observer can plainly see into the pond I is thus possible to observe a tind fish without disturbing him. The light by which the fish are seen is of curse, that which penetrates from the surface of the pond and this illumination, at least so far as three feet below the surface is sufficient to enable the concealed observer to take instantaneous photographs of the totally unsupperting creatures as they lived their own.

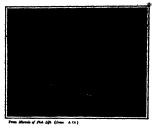
mysterious lives in their own environment.

Some of the results obtained will be startling to persons of only ordinary information on the subject. For listance shess are generally supposed to be creature deroid of emotion or at least very undemonstrative but the frontispiece of Wonders of Pish Life an exquisite bit of color photography shows a perchapiting with fear. This particular study was the climax of a fish drama (more result satisfying than the old fashioned tank drama) which Dr. Ward watched from his piece of concessiment the perch had andaciously swallowed a worm on which a great big rainbow trout had his eye the trout had seen—hence the patient of the first and the provided through the prech had past found out that the trout had seen—hence the patient Then Dr. Ward tails some interesting tituing of a pitch within the photographed through a series of cenditional moments. At one of these moments the pike rests protiouless on the bott tom, with his hoof, but the pike is on the watch all the time is evident from the keen look in his eye Suddenly with ut any movement of the body or other fins the fin on the back will become rest and fully extended, a sure sign of mental agitation. This is when he is no the begint of chariting down on the dace, and lastly we extended the property of the property of the arms of the catches sight of his prey, a dage. The third dramatic moment is when he is on the best of chariting down on the dace, and lastly we extended and disapported has when he see he dace has disappeared.

Perhaps of more definite importance in a scientificsome if only became more dearly demonstrable, are the facts brought out by Dr Ward as to the defensive culoring of fishes. Some of the illustrations given Marrels of Fish Life' are not only convincing wi desce of the aid to concealment afforded the washer species by the peculiar realcoing power of their skins, but also testify to the effective working of photography in the special circumstances of Dr Wards observation pond. To exhibit the various effects of light on the fashes bodies, the investigator has also used an



The same otter in pursuit.



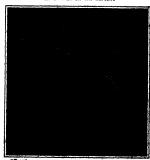
Dr Ward's pond before filling showing ebservation



Dace, showing its dark back, silvery side and white under-surface. As depicted in books.



Gull at rest on the surface



As the fishes see a guil entering the water-deb swimming straight down.

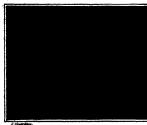
with the control of the addiction in the control of the addiction in the control of the control

But more startling and enlightening photographs of aqualle life obtained by Dr. Ward are those for which he had to go elsewhere than his little observation pond. These, which were also obtained by megas of sub-aqueous photography, have been published since the ap-pearance of "Marveis of Fish Life." Three sets of these marvelous studies of nature are here reproduced from L'Illustration. They are studies respectively of an otter, a gull and a penguin. First comes the otter, as any terrified fish might see him, the air bubotter, as any terrified fish might see him, the air bubes streaming away in his wake, as he noses about among the rocks, seeking what he may devour. There can be no question about the welchedly predatory expression of that head and neck. Next, he is seen in rapid pursuit of his quarry; and the camera informs un just be used only his two hind legs in swimming. Lightly, he is shown nearing the surface (seen from highly of company a term a moderate and in the second property of th s; of course) after a successful raid, with a fish in nouth to be enjoyed at lelaure after landing. The got is shown in one picture much as men are accus-tomed to see him, borne on the rippling waves, and busy wondering where the best fish may be had with the least trouble: the next picture shows him as prob ably no human being ever saw a gull; he has just pierced the surface, and the agonized little fish on the right of the picture is swimming for dear life by shortest way to the bottom. The penguin in the the scorest way to the porton. The penguin in the two photographs reproduced here, shows of how little use legs are to his kind: he walks very little on shore and uses only his wings for swimming. This also explains the mystery of the penguin's wings, with

aqueous photographs of vertebrates are not all the illustrations of Dr. Ward's "Marvels." There are numerous beautiful illustrations of molluses and thuy crustisess. Some of the photographs of fish larvæ trustees. Some of the protographic in his harder is the various stages of development are fine examples of aquatic micro-photography, and the author gives an illustration of a micro-photographic apparatus of his own quintrivance, by means of which "it is possible single-handed to take photographs of living objects in a vertical or horizontal position by daylight or by artifi-cial illumination." This apparatus, which photographs call illumination. Thus apparatus, which procupangue up to a magnification of 2,700, can be used by any photographer, for an object which has first been posed on a stage by an expert biologist. The photographer continues by means of a mirror, the changing positions of my, the young sh in the cell, and makes the ex-

a life remedured here from I/Illustration show mirries life, represented here from L'Hustration, shows the latest attraction provided by a Honolaul hotel for visibles interested in the wonders of Pacific nature. The visitors will descend by a flight of stairs into one or office of these novel showrooms.and watch the movesuch et such Hawatian fagua as may choose to dis-fif Histories for their answement and instruction the immediately adjacent waters:

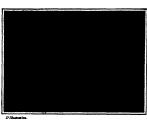
New Berlin Electric Tractages coperations and the Government regarding the describention of the whole suburban tractic the describention of the whole suburban tractic than the describent of the whole suburban tractic and other suburban and other suburban When depositionation, of the whole suburban traction similar will see in interesting one, and is in line ally signifier plains made for London, Paris, and other large within. The present critical situation of Berlin manipuls had not be adoption of the new measure by their the suburban lines will be productated in the sided hodge. NULS. A reservicible growth of populafild before IRIS. A reservable growth of p. n. st. G. Bichard states, is seen in the co



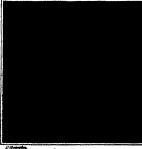
Otter exploring for fish. As seen under water.



Dr. Ward's apparatus for vertical or horizontal micro-photography of live objects.



Penguin swimming under water.



Penguin o ning to the surface head and neck ady above water.

erlin. From 1895 to 1909, or the last cer in fourteen years, the population increased from 2,017,-900 to 2,898,000. For the suburbs the increase is from 382,000 to 807,000, so that the population of Berlin and its suburbs reached 8,705,000 in 1909. As to the traffic on the Metropolitan, this was 75,000 in 1895 and 157,000 in 1909, and the suburban traffic shows 41 and 137 millions, respectively. On Sundays the traffic to the suburbs is as high as 341,000 to 794,000. After failing to secure a solution by the use of steam, it was decided to adopt electric traction on the whole of the lines. to adopt electric traction on the whole of the lines. Then came the question of electric locomotives va. motor cars, and it was found best to use locomotives, as these have some advantages. Each one replaces sev-eral motor cars, and very heavy trains can be drawn by coupling several locomotives together. Because the power machinery is larger the upkeep is less difficult, and the parts are easier of access. Besides, the yield in power is higher in the case of the locomotive. motors are well suspended by springs, and the pa gers are less subjected to shocks than with motor cars. One point is that a great part of the old passenger cars can still be used. For heavy traffic hours, 13-car trains are used and two locomotives take the trains, one in front and one at the rear. Such locomotives work on single-phase alternating current with 15,000 volts on a trolley wire such as is in use in the suburbs of Hamburg and on the Dessau-Bitterfeld line. Current will be furnished by two 150,000 horse-power electric plants, one to be erected at 80 miles from Berlin, near the Bitterfeld coal mines, and from here the current will come over a 60,000-volt power line, using for this purpose six pairs of underground cables. The second electric plant will be at Berlin. The cost of the stations and cables is figured at \$22,000,000, and these tions and cables is figured at \$22,000,000, and these plants will be erected by a company with which a 30 years' contract will be made, as the Prussian Govern-ment-considers that it is preferable not to have the State itself engaged in operating electric plants. Count-ing the central stations and substations along the roads, ing the central stations and substations along the roads the overhead trolley wires, feeders, as well as the rolling stock electrically equipped, including 557 locomotives, 690 new cars, and 29 cars for repairs or upkeep, the total cost is estimated at \$32,000,000, and it is prod to complete the whole of this great enterpris four and one half years.

#### England's Greatest Rainstorm

ON August 26th and 27th, 1912, a serious disaster Overtook the fine farming lands of East Angila (the counties of Norfolk and Suffolk, in England), in tine countries or Arriots and sunois, in England), in the shape of a fall of rain that was without proceded in the British Isles. The catastrophe to agricultural interests was aggravated by the fact that harvesting had been delayed by inclement weather earlier in the month; the deluge carried away the grain that had been cut but not brought in, as well as destroying what remained uncut Forty-two bridges were carried away by the flooded rivers, and an immense amount of other damage was done.

Although the spectacular features of this storm were recorded in the daily papers at the time, it has required some months for the collection of exact statistics of the rainfall. These have now been gathered, tabulated and charted by Dr. H. R. Mill, director of the British Rainfall Organization, who announces that the greatest long-continued widespread rain previously the greatest long-continued waterpread rain previously recorded in any part of the British Isles produced only half the volume of the East Anglian fall. In fact, only two instances could be found—July, 1875, and November, 1878—in which the rainfall of a whole mouth exceeded that of the 24 hours during which the recent torm continued.

While for scientific purposes rainfall is always re ported in inches, to the layman such measurements are decidedly less impressive than statements as to the actual volume or weight of the rain. It may therefore, be interesting to record that during the brief storm in question 150,242 million gallons of water fell in the county of Norfolk alone, the weight of which was 670,720,000 tons. This is more than twice as much was 670,720,000 tons. This is more than twice as much water as is contained in Windermere, the largest of the English lake

An interesting local industry affected by the storm was canary raising, which is extensively carried on at Norwich. The birds are raised for the most part by workingmen, who keep the cages in sheds in their gardens. These were the first to be flooded, and as the highest concern was the saving of human life, no the ingnest concern was the saving of admin life, no attempt could be made to move the enges. It is said that at least one particular strain of Norwich canary has been wiped out.

A Novel Aeropiane Propeller.—Spencer Heath of Washington, D. C., has patented, No. 1,043,880, a pro-peller formed from a blank of sheet material which is folded longitudinally to produce a number of thickness to form reinforcements and give the necessary stress

# The Heavens in January, 1918

### Is Venus a Dead or a Living World?

### By Henry Norris Russell, Ph.D., Professor of Astronomy in Princeton University

O NE of the most interesting objects for the amateur observer at the beginning of this new year is the planet Venus, which is now well placed in the western sky, setting between 8:30 and 9 P. M. With the telescope she appears like the Moon about one day after her first quarter, and with a magnifying power of 100 looks almost exactly the size that the Moon does to the unaided eye. The novice at the telescope will the unaided eye. The novice at the telescope will hardly believe this, for the inexperienced eye in looking at an object in the circumscribed field of a tele-scope unconsciously focuses itself as if on a neighboring object, quite differently from the way in which it adjusts itself to view the Moon in the open sky, and this unconsciously affects our judgment of the apperthis unconsciously strects our judgment or the apper-nt size of the planet, as seen in the telescope. If the Moon can be seen in the open sky with one eye, and Venus through the telescope with the other, the true relation of the two images is apparent.

Though Venus is one of the most satisfactory objects on a first telescopic view to a beginner, she is one of the most aggravating to an experienced observer, for

her brilliant surface obstinately refuses to show any definite markings by which we might hope to find in what period her rotation took place, or what was the inclination of her axis Faint, ill-defined, fugitive shadings have occasionally been noticed, but they cannot be recognized on later nights, and leave us no wiser on the matters which we might wish to

That the planet's rotation is slow is however proved by two lines of evidence. First, when she is nearest us, and, in particular, when she passes between us and the Sun, as in 1874 and 1882, her diameter can be measured with great precision, and it has been found that her surface is practically spherical. We know that the Earth's rotation causes it to bulge at the equator, so that the polar diameter is 26 miles shorter than the equatorial. An equally great oblateness of Venus would have been very clearly revealed by such measures as have been described; and if the amount had been even one third as great, it would have been capable of detection. But to get one third of the flattening in the case of the Earth the period of rotation would have to be increased from one day to nine. Conditions on Venus are in this respect very similar; and we can con-clude that if the rotation period of Venus was much less than ten of our days, the flattening at her poles could hardly have escaped detection, unless, indeed, her axis was very highly inclined to the plane of her orbit, and at the time of transit we

looked almost squarely down on one of her poles, which seems decidedly improbable.

Another searching test was made some years ago at the Lowell Observatory, when Dr. Lowell and Mr. Slipher attacked the problem with the aid of the spectroscope. If the spectrum of the planet is photographed in such a way that the light which forms one side of the strip of spectrum comes from one limb of the planet, and that on the opposite side from the other, and if the planet is in rotation, so that one limb is approaching us and the other receding, the lines in the spectrum will be shifted, in accordance with the well known principle, to the violet on one side of the spectrum and to the red on the other, so that they run across it obliquely, and not at right angles. From measures of this slant the rate of motion of the planet's counter, and hence the period of rotation, may be com-

This method was tested with very satisfactory resuits on Mars, Jupiter and Saturn, giving values for the rotation period very close to those already known to be correct. In more recent time it has given astronomy its first definite knowledge of the rotation period of Frants But when applied to Yenus it gave nega-tive results. The lines in the spectrum ran squarely across it, and the most careful measurements, made with all precautions, showed that if there was any tilt at all, and hence any rotation of Venus, the tilt must be excessively small and the rotation very slow Anything much faster than one turn per mouth could probably have been detected.

Here the matter rests at present so far as observa-

tional evidence goes. Dr. Lowell believes that, as in the case of Mercury. Venus keeps always the same side toward the Sun, rotating once in 225 days, the period of her orbital revolution. An alternative theory, equally consistent with the observations, has been w equally commutent with the observations, and been pro-posed by an English meteorologist, Mr. Clayden. The surface of Venus is so white, and reflects so large a proportion of the sunlight which falls on it, that we propagation of the samples wind a failed of it is composed either of snow or clouds. As the Sun's heat would be twice as great on Yenus as here, permanent snow all over the planet is out of the question; clouds remain as the only alternative. These may be, as Dr. man as the only alternative. These may be, as Dr. Lowell thinks, clouds of dust stirred up by the violent winds which sweep over the planet's surface from its desert but estreally smulti adds to the cold, dark temisphere of night, where the cosans of the planet—if were it had any—are piled up in mountains of the, Mr. Clayden, on the other hand, assumes the clouds the clayden, on the other hand, assumes the clouds

pary clouds of water vapor. rotated as fast as the Earth, these would presumably

At 9 o'clock : Feb. 6. At 8 4 o'clock : Feb. 14. At 914 o'clocks January 29

NIGHT SKY: JANUARY AND PEBRUARY.

arrange themselves, as on our own planet, in patches and masses, denser in some latitudes than others, but with clear spaces between. If the planet always turned the same side to the Sun, clouds of the sort we are now considering could hardly exist at all on its sunward side. But, according to Mr. Clayden, if the period of rotation was several weeks in length, the atmospheric circulation would depend directly on the

period or rotation was several weeks in segupt, the atmospheric circulation would depend directly on the planet's rotation, and it would be quite possible for the side toward the four to be permanently doudly, with perhaps regions of broken cloth here and there, with the property of the property of the side toward the four cloth and the property of the side of the property of the in surface as it undoubtedly is in size and mass, with an atmosphere and oceans, rotating far more slowly than the Earth, but yet so that the intervals of continuous light or Gartness size not as long as in our own Arctic or Antarctic lands, with a sixy powhead always with loads demse sought to reflect away fatto space the dassing beams of the Sim, leaving below them perhaps no more light, and no excess of least above what we ourselves are familiar with; a swettl,

is short, which might be perfectly filted to be the at of life such as exists on one even Easth. Receives two is our present inevities be breingistation of choose, tantalised perhaps by the thought filed in second kypothesis be true, the true eighteen of world so much like our own is flowerer hidden. It us by the cloudy wall that proceeds it from the base

real Property

Our map shows what may be seen in the sweet satisfaction attice as these would appear to a man bring fast this back and gazing at the whole ratifs of heaven

Right overhead and southward to the harison is the finest region of all the starry sky, stretching from Genini, Taurus, and Auriga past the two Des Starrs and Orion into Argo, whose great star Composi can be seen low in the south from all latitudes south of Vir-

ous, Cetus, and Places fill the dull southwest sky. Arise, Perseus and Andromeda are in the porth-west; Casslopeia, Cephena, Draco, and Ursa Minor in the north; Ursa Major in the northeast; and Leo and Hydra in the

The Plenets.

Mercury is morning star this month, rising about 5:50 A. M. on the lst, and being visible in the dawn, while later on he draws nearer to the Sun and is not

Venus is a splendid evening star, as

Mars is morning star in Scorpio and Sagitarius, rising early in the month at about the same time as Mercury, with whom he is in conjunction on the 9th, but remaining in sight after the latter

vanishes from the morning sky.

Jupiter is also a morning star, rising about 6 A. M. in the middle of the month. about 6 A. M. in the middle of the month.

On the 11th he is in conjunction with
Mercury, and on the 18th with Mars.

All three planets are then within a few
degrees of one another, but not conveni-

ently placed for observation.

Saturn is in Taurus and is well observable, coming to the meridian at 9 P. M. the 1st and at 7 P. M. on the Sist

Uranus is in conjunction with the Sun

n the 23rd, and is invisible.

Neptune is in Gemini, and comes to pposition on the 14th. He may easily be found (with a telescope) by means of

be found (with a telescope) by means of the map published last month. The Moon is new at 5 A. M. on the 7th, in her first quarter at 11 A. M. on the 15th, full at 11 A. M. on the 25th, and in her last quarter at 2 A. M. on the 25th, at the Earth on the 25th, and barthest sway

She is nearest the Earth on the Zero, and Darmes eway on the 11th. As she moves around the sities she plases through conjunction with Mercury, Mars and Juptier on the 5th, Uranus on the 8th, Venus on the morning of the 11th. Saturn on that of the 18th, and Neptune none of the observable conjunctions being

#### To Our Subscribers

WE are at the close of another year—the eighth of the SCHENTERS AMERICAN'S life. V v eighth of the Schwerzer American's 1fa. Since the subscription of many a subscriber expires, it will not be gains to call attention to the fact that the serigition be not reserved. In order to avoid any in-terruption in the receipt of the paper, whenerigitions should be renewed before the publication of the list sense of the new year.

issue of the new year. To those who are not familiar with the Schmitzero Aristons Suprements a word may not be one of piece. The Schmitzero Aristons Suprementation from the Schmitzero Aristons articles too long for insertion in the Schmitzero Aristons, as well as translations from foreign periodicals, the information despitated in which would otherwise be shanouselible. By taking the Schmitzero Aristons assessment and Supremanner the subscript provises the impact of g the dispetion in the subscription prior.

The British Association for the Adva Beleites will hold its next meeting at Bisming sing Suptember 10th, 1816

### Marie Chailes Planet Six Marcus Benjamin, Ph.D.

E TENTON

THIS year the American Semination Fa.D. for the AS-vancouser of Release with mean in Cleveland, Ohio, the which place it returns after the influence of treety-rieurs. The presiding officer of the meeting will be Ravand Charries Feliciating who host maintent of thring astronomers in the Utiled Sintee. Fred Pickening was horn in Science. And an July 13th, 15th. The is the son of Science Teach Carlotte Hammond Pickening. He accepts on his father's side goes back to John Pickering, who came from England and settled in Selma in 18dB, and Incident among other

oes oner to John Pickering, who came iron langual on actived in Salem in 1848, and lacisdes among other integratished persons famous in the history of our ountry, Cel. Timothy Pickering, who after service note: Washington in the field became Postmaster General Washington in the field became Postmaster General eral, then Secretary of War, and finally Secretary of State during the administrations of Washington and

Anama.

Young Pickering was educated at the famous Boston
Latin School, and then passed to the Lawrence Scientiffs School of Harvard, where he was graduated in
1866 with the degree of B.S., having taken the course

in civil engineering.

His ability had been so evident during his underate years that he was at once made an instructor atics in the Lawrence School, but his stay was short; for in 1868 he was called to fill the Thayer was snort; for in 1905 as was cancet to in the Innyer-chair of physics in the then recently organized Massa-chusetts Institute of Technology, where he remained for nine years. During this period he organized the for nine years. During this period he organised the first working laboratory in physics in the United States and the methods inaugurated by him have since been adopted elsewhere. In connection, with his work he prepared the volume on "Physical Manipulation" (1874), a text-book that has received high commenda-

tion and is still universally esteemed.

In 1876, soon after the death of Prof. Joseph Win-lock, he was called to the chair of Geodesy and Astronomy in Harvard with the directorship of the great

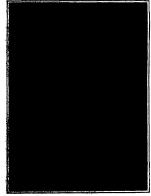
tronomy in Harvard with the directorabil of the great observatory there, which place he has since held. With his extraordinary real for investigation and at his disposal a splendid instrument of 24-inch aper-ture, the lens of which was ground by Clark, Prod. Foldering at once began those special studies that hive gained for him and the Harvard Observatory so, such renown. These studies have been largely develod to examination of the light and spectra of the spars for the purpose of determining their brightness. "For this object he devised a mechanical meridian photospeter with which he has made over a million and a half with which he has made over a million and a half with which as has made over a million and a main measurements of the light of the stars. The details of this work were given in a catalogue entitled "Mar-vard Photometry." in which he gives the magnitude of over 4,000 stars, and in a later publication similar measurements of more than 21,000 stars are given. He measured Jupiter's satellites while they were under-going eclipse from 1878 to 1891, as well as the satel-lites of Mars and other faint objects. Subsequent to the death of Henry Draper he began the application of photography to astronomy and in a memorial to his friend he undertook an investigation of the spectra of the stars by photography on a scale greater than ever before attempted, resulting in the publication of an elaborate memoir dedicated to the memory of his

colleague. In consequence of a fund of \$250,000 left by Uriah A. Boyden to the observatory for the special purpos of studying the stars at high altitudes, he established in 1890, an observing station at Arequipa, Peru, and there his brother, William H. Pickering, observed the stars of the southern heavens, thus extending the work that had been begun in Cambridge, until photographic that has been begin in Carriage, and the pole have been made. These and other studies of the work accomplished under his direction have for the most part

compussed under mis direction nave nor it been published in the "Annials" of the Harvard Observatory of which nearly one hundred quarto volumes have been given to the world, and of these more than one hills have been issued under his editorably since he became director.

other scientific activities, and they His other scientific activities, and they have been usany, included services as a member of the U. S. Nautical Almanac Expedition sent to Monat; Presant, Lowe, 50 observe the total notines of the unt on August 7th, 1905, and he was also a member of the party sent by the U. S. Coast Spring, the a stringer purpose to Xeries, Spring, 10 December, 1970. The striptors Spain, in December, 1870. The subjects of mountain surveying, the height and velocity of clouds have attracted his attention, and he did mount however the commission of the Ampalechian Mountain (Tab. of which he was the first president in 1871, and again served that club in a line except, in 1881.

gnition. He received the Henry Draper gold medal from the National Acade Belences in 1877. The Royal Astronomical Society of London gave him a gold medal in 1886 for his photophic researches, and again in 1901 for his studies variable stars. He received the Rumford medals Bodety of the Pacific in 1893, Michigan in 1897, Chicago in 1903, California in 1886, Michigan in 1887, Chicago in 1801, and Fennayivania in 1906, have conferred the dagges of LLD, upon him, while Victoria gave him a 8a.D, in 1900 and Heidelberg in 1903 bestowed upon him the degree of Ph.D. The German Emperor contains the degree of Ph.D. ferred upon him in 1911 the order Pour le Merite with the rank of kuight, thus indicating the high apprecia-



Prof. Edward Charles Pickering.

dent of the American Association for the Advancement

tion with which his work is regarded by the savants

File elections to scientific academies have been us. In 1873 he was chosen to membership in tional Academy of Sciences, and he has long the Nati the National Academy or Sciences, and he has long been a fellow of the American Academy of Arts and Sciences (vice-president in 1877) and a member of the American Philosophical Society since 1806 (vice-9). He also holds honorary or correuding connections with the Royal Society of London. the Royal Astronomical Society and of the great acad emies of sciences in St. Petersburg, Berlin, and Rome.

well as of many other less well known.

He was elected to the American Association for the Advancement of Science at its Salem meeting in 1869 and was advanced to the grade of fellow in 1875. His affiliations have always been with the sections devoted to mathematics and astronomy, and physics. sen to preside over the section on the physical sciences in 1677, and at that meeting pres address on the Endowment of Research. No astronomer has been called to fill the high office of president of the American Association since 1803, when the late William Harkness held that important office. At the meeting held in Washington a year ago, when the claims of astronomers were considered, the candidate

who at once commanded the recognition of his coileagues by his distinction in his chosen science, was Prof. Pickering, who was then unanimously chopreside at the Cleveland meeting, which will be held during the present week

#### A Demonstration of Forestry Erosion Proce By Stephen Byrd

EXPERTS of the Government have been successful in the construction of a striking working model showing the processes of erosion on deforested slopes. It is for the use of pupils in public schools who are taking courses in nature study, elementary agriculture and physical geography.

The model, about seven feet square, consists of two The model, about seven feet square, consists of two hills sloping down into two valleys through which two streams wind in and out through farm land and lead into two lakes at the front of the landscape. Both hills are made of the same kind of soil, but one is covered thickly with twigs, young trees, or shrubs, to simulate a forest, underneath which is a heavy curpet of moss representing the layer of leaves and twigs which covers the ground in the real forest, while the other hill is bare of all vegetation.

means of a suitable sprinkling device on the ends of a "T" about 11/2 feet above the crests of the hills, water in the form of rain is made to full with equal force upon the two hills. On the forested slope its fall is broken by the foliage and it drops gently upon the moss-covered surface of the ground. The moss and the soil beneath, which is kept soft and porous by the protective cover, quickly absorb the "rain" and allow it to seep out as clear water farther down the slope, thus forming a mountain stream which flows through a green and fertile valley into a clear lake

at the lower end of the model.

On the other slope the "rain" beating down upon unprotected and hardened surface washes deep guilles the hillside, carries the soil into the turbid which drains the valley below, and thence into a muddy lake. The erosion on the slope loosens stones, which are carried down upon the valley farms; the will deposited in the channel of the stream diverts the water, which opens up gullies through the dry land; the main stream is made shallower and wider and often overflowers into the fields; island and slit bars rise in the stream; and deltas are built up in charac-

the in the stream, and tens are out up in charac-teristic form at the entrance to the lake.

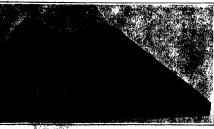
The croston processes which work themselves out in the model, the wearing down of the hill, the silting up of the stream bed, the gradual shifting of the course of the stream, the formation of deltas and sand bars in the lake, and the gradual opening up of war courses through them are all typical of the process constantly going on in nature and show strikingly the close relationship between forests and surface formation. It is the same process of erosion on a larger scale which, after the destruction of our forests, causes the removal of the top soil from our slopes, cuts them up into guiltes, and deposits sand and gravel upon the fertile alluvial soil of the bottom lands, in storage reservoirs, or in the channels of streams, where it

les navigation and caus w overflow. While the model is not intended primarily to show more than the erosion processes, it can be used to show also that a forest-covered slope acts as a reservoir in impounding the water and allowing it to seep slowly into the streams, and, on the other hand, that water runs off the surface of a bare slope as soon as it falls, resulting in floods when the precipitation is heavy and in droughts during a dry season. If the sprinkler is stopped and all the water taken out of both of the stronm and the lakes, the lake on the forest side will. within a few hours, receive a considerable amount of water as seepage from the wooded hillside, while the

other lake will remain practically empty. When the water is first turned on, that which comes from the forested hill will be slightly muddy, but will clear after running for a few minutes, and the mud will soon settle. Erosion will set in upon the deforested hill and the land below in

a few hours

In some of the models white sand and pebbles and small goldfish or turtles in the clear lake, have added a touch of realism and brought out the clearness of the water. Other ideas to add to the picturesqueness and instructiveness of the model have also been evolved, such as a road running through the fields, bridges across the streams, and a little farm e or barn appropriately placed bridge across the muddy stream is represented as damaged by floods, and the road on that side of the model muddy and deeply furrowed. In the construction of (Concluded on page 600)



Westing smalled for demonstrating to pupils in public schools, the processes of sreadon on deformeted slopes. . . 21

# Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

#### A New Aluminium Level

A LEVEI, has recently been placed on the market made of aluminium, which for a metal level is light, as well as strong and durable. It will not wan, and with ordinary care will last a lifetime, not being affected by either dampness or heat.

It is doubly constructed; that is, it has two plumbs and two levels, so that no matter in what position it is picked up, it is always ready for use and can be used either end or edge up. The illustrations show it in use with the eye of the mechanic both above below it. Plumbing can also be done with the Plumbing can also be done with the eye

above or below the spirit glasses.

There are two wires around each spirit glass, so that the position of the bulb can instantly be seen. The spirit glasses are securely set and cannot move or be jarred out of place. They are also guarded by heavy

jarred out of piace. They are also guarded by heavy lenses set in the circular openings of the level frame to make the spirit glasses dust, dirt and water proof. For the use of carpenters, millwrights, censent work-ers and plasterers the level is made in lengths of 3 feet 8 inches, 24 and 30 inches. Those designed for the use of machinists and others destring shorter levels, are made 12 inches and 18 inches long.

#### A Combination Bevel Square

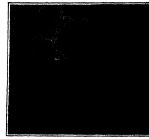
A SQUARE has been produced which combines a bevei square, divider and pencil compass, and measures ten inches over all when folded. The stock is formed with flanges on both sides, and the adjustable blade folds between the sides of the stock. In scribing angles from narrow flutes, or grooves, the operator can insert the flange of the stock in the groove and work from the face of the bevel. The square can be work from the lace of the lower. The square can be set with the pointed ends at any desired distance apart. Thus it is converted into a good divider. When used in the same form, with a pencil inserted in the holder at the outer end of the stock, it becomes an excellent pencil compass.

#### A Combination Pocket Rule

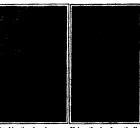
THE six-inch folding pocket rule, two views of which are given in the accompanying illustrations, is made of spring German silver and distinctly gradnated. It can be used as a hook rule, caliper gage, protractor, triangle or try-square. The upper edge is graduated in thirty-seconds; the lower edge in six-teenths. The caliper blade is graduated in sixteenths on one side and thirty-seconds on the other. The proon one side and thirty-seconds on the other. The pro-tractor is divided to five degrees and the vernier reads to one half a degree. This rule can be set to any desired angle, and the center joint is so constructed that the rule remains firm wherever set. The protractor is divided into lines, each representing five de-grees. The ten parts on the vernier correspond with the nine parts on the protractor. Consequently, each division on the vernier is smaller than each division on the protractor by one half degree. To read the distance the rule is opened and the number of lines on the protractor that have been moved from the zero point is first noted. Upon the vernier the number of divisions is then counted until one is found which coincides with one on the protractor, which will be the number of degrees or half degrees to be added to the number of degrees or half degrees distance read off on the protractor.

### A Machine That Addresses Tags

AFEW years ago it was discovered in one of the large fertilizer companies in this country that dur-A large fertilizer companies in this country tana unring the busy shipping season of six weeks or more, it took every clerk in the office and everyone in the establishment, who could write with a pea and ink, six weeks or more to address shipping tags. By the time the shipping season was over, the work of everybody connected with the office force was so far behind that the country of the count t took until the next busy shipping season to catch up This led to the invention of the tag addressing ma To-day, in that same establishment, the tag addressing machine, the first one ever produced, sta on the end of a long table in the basement. It is on the end of a long title in the basement. It is operated by a boy, who addresses all the tags required in the shipping department of the fertilizer company referred to. In spite of the fact that the business has referred to. In spite of the fact that the business has increased wonderfully from what it was five years ago, when the tag addressing machine was installed, the boy has plenty of time to devote to other duties. At a test recently, the boy in one minute addressed at a test recently, the boy in one induce adversed two hundred and seventy-eight shipping tags, including setting up the name and address. In two seconds or thereabout the type wheels of the machine were reed to neutral and he was ready for another name and address.



Using the aluminium level horizontally.



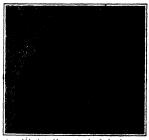
Combination bevel square. Using the level vertically.



The combination pocket rule used as a caliper gage.



The vernier protractor of the combination pocket rule.



A machine that addresses two hundred and seventy-

The tage for use in the tag addressing maximum must automatically fad up into and through the machine in a strip from the storage bin in the cabinet, the tage being asparated by a cut across to within 6715 fact on

ench ann.

The business card is printed from an ensurement attached to and made part of the mediline.

The consigner's name and address is printed by type

method the second se

wheels, being adjusted by means of levers. A dist is set for the number of tags required for shipment and is automatically cleared when the number indi-cated has been printed.

There are no loose types in this machine and mere are no roose types in this machine and po-simulis or plates, the type wheels being soverned, by a name lever and an address lever. An automatic counting device on the machine absolutely course fits number of tags printed, looking and cutting off the tags when the number indicated on the dist are ad-dressed.

The machine is built to take a Standard rec. n cap or record card as well as a very thin paster, which can be attached to cartons or boxes by means of paste or fasteners as the requirements of the shipper may

The machine prints the name and address or nsignee and such other information as may be destred.

desired.

The automatic counting device does away emirgey with the possibility of loss through undershipments or overshipments, as the machine will produce exactly the number of addressed tags indicated in sank in-

#### Prize Offered for a Test to Detect Flaws in Autogenous Welds

THERE is at the present day one obstacle in the I way of a more general adoption of autogenous welf-ing of metal constructions which in use are subjected to considerable strains, and the rupture of which would endanger human life and property. This eletacle resides in the fact that no process is known by which the quality of the finished weld can be tested. Experiments have shown that the first condition to be

Experiments have shown that the first condition to be indilled if the well is to be sound, is that findustens, large or small, must be avoided, and that the material does not become overheasted in the process of vedding. The Central Bureau for Acetylene and Autogenous Michael Working in Nitraberg, with a view to perfecting the autogenous welding processes, has decided to offer prises of an aggregate of 1,000 marks (3875) for the accessful treatment of the problem stated below. The Carbidhandelspresilechaft in. b. H. has generously furnished the requisite funds.

Problem: How can also inclusions and unsound places, as well as flaws the to overheating, be detected

places, as well as flaws due to overheating, be detected in an autogenous weld, without injuring the weld in the process of testing?

In adjudicating the prise, special merit will be assigned to processes which make use of simple, read-ily transportable apparatus. It should also be noted that prizes may also be awarded to the originators of such processes as furnish a means of judging the quality of a weld satisfactorily in a majority of cases, without necessarily representing a complete solution of

The thesis must be submitted in writing, and must The thesis must be submitted in writing, and must be identified by a motte, the name of the competitor to be filed in a scaled surelope, together with the motto appearing on the thesis. Butties must be completed ed or before July 1st, 1913, and each to the address appearing at the end of this amouncement.

The jury will consist of the following sustlemen: (eds.). Registruggart Prof. Dr. Ing. Dr. F. Wüst, president of the Iron Institute of Aschen.

Prof. Dr. Ing. G. Schlesinger, president of the Mechanical Engineering Experiment Station at the Technical University of Charlottenburg.

mosa University of Charlottenburg.

Frof. E. Baumann, director of the Bureau for Testing Materials of the Technical University of Stuttgart.

Insurieur Hermann Richtor, professor at the Technical Professional Schools of Hamburg.

Ical Processions schools or Hamburg.

Karl Schröder, chief engineer of the Ballway Suplies Company of Upper Silesia.

One representative of the undersigned Büro.

The primes are awarded by the jury.

The first prise will be 1,000 marks (8300); the see-

The first prize will be lave masses on do, 600 marks (\$126).
The thesis for which the prize is awarded will be gittlebed without componention. (Rigned) Estarbildro 5th Acetylen und Autogene detailboarheitung, Niraberg, Gugelett 54.

C. a procest case in the United States Bioletical Court, Southern Districts of the York, Mr. Jestiche Mayer, District adjas, in his deptison, the invention, be-really the process of the process of the invention of the patent in sult, that at of automatic invaluations water heat-ing lied bi-yelegoid along two made. Hence (a) the "entagent water valve" heater and (b) the "estudget thermostatic" beater. The presented to plott out the derects in He presented to point out the defects in both (c) and (b) forms of heater, and that while one was not a commercial sucto natural gas territory, because of the large cost of operation in artificial gas territory, and said:

The problem to be solved and here claimed to have been solved was to produce as inmiximations, assumantly water haster which would (3) be extry (3) be economical; (8) heaft the water to a desired predetermined templementure, and (4) proportion gas consumed to amount of the water drawn, were in localitate where gas and water main presentes flucmixing the solution of the soluti

the where gas and water main pressures so-tests.

"That was as interesting problem having to "That was as interesting problem having to the problem to hashin and comfort.

"Rund was an experienced man who had already made contributions to the art, and he was able, therefore, to approach the considera-tion of this problem in a practical way. He was not searching for a theory, but for an other contribution of the considera-tion of this problem in a practical way. He was not searching for a theory, but for an other contribution of the consideration of the was not searching for a theory, but for an other contribution of the contribution of the con-tribution of

called.

"From the outset, this T. V. heater became a commercial success, so much so that the Mosarch Company, a competitor, adopted the Burd invention at a time when the patent application was pending and when letters had

#### He then asks:

"Was there inventive genius behind this production or was it obvious to the man skilled in the art and a mere aggregation of old ele-ments and not a combination attaining a new

The object of the invention set forth in the patent in suit is stated in the patent itself to be:

"To provide "To provide effective and reliable means whereby waste of gas, during periods in which is is not desired to heat water, may be prevailed, and latefully to damage to the Bestime to the contraction of the

To accomplish these objects, Rund inare accomplish these objects, audd in-troduced into the gas service conduit a gas supply valve and a gas regulating valve, by which two valves the supply of gas to the main burners is controlled and

"The main or water actuated gas valve is always thrown wide open, and is of sufficient isse to seduce recognized to be higher than the control of the control of the control of the main presents, and the lowest gas main presents. With the high water main presents, and presents and presents along the supplied of the control of the contr

the water would on answer to a master women at a low water make pressure than at a high and a low water make pressure that a construction of the second of t

No.

"Thus the water is heated to the desired appearance, whether a large or small amount water within the departed of the heater is any device within the departy of as to the age drawn, said the entryly plaqued as to the standard of the entryly language and it is not heated, and of the entryly language and if may be the water main or gas main of the standard of time, when water being drawn; and if he years is being drawn; and if he years is being with the first of a to the barrance is solding.

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out off by the water actuated or main

opt of by the water actuated or main gas arine.

"It is old in the art to employ the move-ments of a part actuated by the flow of the water through the heater to control the flow of gas to the burses of the heater; and it was able old to employ the spevements of a heat to the bursers. These old elements had been superately used in heaters to control the flow of fael to the bursers, but Raud, for the fart time (it is claimed), combined the two ele-ments of the control of the control of the con-line scitted on a the reference, that this combination produced a sensit which was not an aggregation of sid elements, each merely perferming an old said will known franction and not brigging about a few secult. If I am and not brigging about a few secult. If it am and not brigging about a few secult. If it am and not brigging about a few secult. If it am and not brigging about a few secult. If it am and not brigging about a few secult. If it am the secult is the secult in the secult is secult in the secult is the secult in the secult is and the secult is secul-tated upon by complainant, was accomplished by the combination of these old elements, then it seems to me that the case is one of invon-tion.

If secure to me.

If secure to

T. V. bester.

"In his ingusious argument that certain of
these patents accomplished by a short arm
what Rund accomplished by a short arm
what Rund accomplished by a long arm, the
learned counsel for defendant failed to make
clear how what was obvious (sa he urged) so
successfully ecaped the attention of these
many livenious whose minds were moving
along in the same gueral direction."

#### Notes for Inventors

Notes for Inventors

A Nevel Explostery Regulator for Projectiles.—Cleland Davis, U. S. Navy, has patented. No. 1048,074, a trajectory regulator in which there is combined with the projectile, plates which are mounted therein and move radially through centrifugal force to regulate the trajectory, and electric controlling means are provided which govern the extent of the outward movement of the plates.

A Power-operated Coupon Cutter.—A power-operated cutter to ellp coupons is shown in the patent, No. 1,042,436, to Carret A. Bobast of Researcy, N. J. It is an electrically operated misdine supplied with a fmife-carrier pivotally supported at one end with a kmife at its other end and an one end with a turn at its caner can am an oscillating lever which is operatively con-nected with the knife-carrier and is oper-ated through a suitable plunger by a

"Sandwich Paper," a New Paper Prod-"Sandwich Paper," a New Paper Product.—A Fronch paper devoted to paper manufactures, tells of a new paper product said to have been invented in Germany. It consists of two thin sheeks of paper pulpibetween which is arranged a sheet of cotton or similar cloth with which the pulp layers are the product of the pulpibet or annuar coon with which the purp myers are so thoroughly incorporated as to form practically an integral and compact sheet. It has been aptly called a sandwich paper and is adapted to a variety of uses.

and is adapted to a variety of uses.

A Silding Pad for Baseball Players.—
Frederick C. Clarks of Winfield, Kan, assignor to A. G. Spalding & Brox., Jeruy City, has patented, No. 1,044,094, a sliding ped which is destanably secured to a garment and extends around the greater portion thereof. The pad is generally rectuagalar in outline and a loose lining is secured only at its edges to the pad, the pad being especially dickinged for use in aliding to bases.

Mixtur Oil and Gasoline.-We are told Mixing Oil and Gasslina.—We are told that the fifthermen of the coast of Maino, using motor boats, feed the labelesting oil to the cylinder with the changes of gasoline and dispense entirely with the labelesting coups on the cylinders. In this way, they avoid the care of the sup and are sure the oil is feeding so long as the gasicine supply is maintained. Ordinarely, about one pisated oil is mixed with five galloniary and oil is mixed with five galloniar of gasolinas. The only objection suggested to the precities is that the early unserved some foultand

to have a foot portion at one end of the leg and having at the opposite end of the leg and on the forward side thereof a fullness adapted to receive the knee of the wearer with an extension on the opposite side, the fullness and extension constituting the hee and toe of a reserve foot portion, it being the intention to wear out one foot portion and then the other, so that the leg of the stocking will do double service.

The End of Human Improvement.—In his report of the operations of the Patent Office during the year 1843, Henry L. Elisworth, the then Commissioner of Patents, called attention to the whole number of patents issued by the United States up to January, 1844, as being thirteen thousand January, 1974, as being timreen housand five hundred and twenty-three, and to five hundred and thirty-one of these patents having been granted in 1843, being an in-orease of twenty-four over the previous year. Then, apparently appalled by the great development and perfection of all the arts, the honorable Commissioner suggests are, the induction of invention at some early day in the following words embodied in his official report: "The advancement of the arts, from year to year, taxes our credulity and seems to presage the arrival of that period when human improvement must end."

Safeguarding the Operator.—In connec Safeguarding the Operator.—In connec-tion with a punch press or smiler machine having a dangerous part, the operation of which is periodic, Frank C. Spencer of Chicago, Ill., provides in a patent, No. 1,043,876, a protective means which is actu-ated automatically in accordage with the periodic operation of the dangerous part and includes a gate which wave from more and includes a gate which moves from one side of the operator's arms and transversely thereto into position in front of the danger-ous part so that the operator's hands will be pushed away from the dangerous part as the gate moves into operative position.

A Life-saving Garment for Aviators.— The garment shown in patent, No. 1,042,-327, to Joseph J. Costenzo of Alexandria, 321, to Joseph J. Costenzo of Alexandra, Egypt, is made with a number of concen-tric inflatable members adapted to be positioned around the body and collect-ively form a covering for the body, each of the members comprising a plurality of inflatable chambers and means are provided for holding the chambers in each member together.

Some Adjudicated Patents.-Among th adjudicated patents reported in recent are The Loesser & Loesser patent, No 573,672, for a diamond polishing "dope," which was held invalid in American Patent which was held invalid in American Patent Diamond Dop Company v. Wood; the Fessenden patent, No. 706,736, for appara-tus for wireless telegraphy which was held not infringed in United Wireless Telegraph Company v. National Electric Signalling Company; the Parsons' patent, No. 723,-Company: the Parsons' patent, No. 725,-299, for an armor for postumate tires which was held valid and infringed in Parsons Non Sind Company v. Atlas Chain Com-pany and the Wood patent, No. 839,356, for a process of dividing diamonds which was held invalid in Wood v. Kahn.

#### Legal Notes

An Adjudicated Patent.-- In the case of the Gilbert Manufacturing Company v. Post & Lester Company, 197 Fed. Rep., 56, the Bowers' patent, No. 872,892, for a spare tire holder for automobiles was held void for lack of invention.

Revision of Patent Law.—It is reported that the chairman of the House Commit-tee on Patents, Mr. Oldfield, intends to de-mand action upon his recodification bill mand action upon his reconlineation but which was introduced during the latter portion of the last Congressional session and that he has called a meeting of his committee to take under consideration the steps necessary to secure the legislation he desires. It is probable that a unanimous react will support the recommendations of that he has called a meeting of his commute. The too take under consideration that steps to his nat not construct the control of the construction which the construction which the construction which the construction which the construction of the construction which the construction which the construction which the construction of the construction which the construction of the construction which construction which the construction of the construction which construction which the construction of the construction which construction whic

RECENTLY PATENTED INVENTIONS These columns are open to all patentees.

The notices are inserted by special arrangement with the inventors Terms on application to the Advertising Department of the SCIENTIPIC AMERICAN.

tion to the Advertising Department of the RICHERIPICA MERICAN.

FORTAINING TO APPARED.

GARMENT CLASP.—M. KERCHER, 14
Lowis St., New York, N. Y. This class isculudes a loop and a tak carrying a bottom of the combine the law of the combine the tab with the buckle from which the loop and the tab are suspended in a novel meaner. The chasp is more specially intended meaner. The chasp is more specially intended Maywood, Couring, Cai This improvement is in poeter for meris outer garments and has particular reference to the construction of a poeter directly forcein matter such as disastron, and the control of the poeters of the control of the poeter of the control of the contr

#### Of Interest t

Of Interest to Parmors.
CULTYINDO.—It. H. PINENIA. Bondale.
Miss. This invention provides a main death
beam with two attachments, one a supplemental pivoted beam carrying a scraper or
other cultivating device to swing intensity,
to vary the lateral angle of the scraper; the
other is a runner and gage arranged in rear
of the supplemental beam and adapted for
varical adjustment, to vary the depth at
which the scraper or other tool shall enter
the soil.

which the eraper of other thois annia state that the property of the property

times under control
DISK PLOW AND REAM THEREFOR.—A.
N McKRILIPS, R. F. D No 2. Billings, Mont.
In the prevent parent the invention has reference to disk plows, and it has for its purpose
the provision of one with a beam having a
curved end, and disponed around and secured
to a bearing, in which is journaised a stud
secured to and projecting from a disk

#### Of General Interest.

Of General Interest.
TOILET FOWN DE BIRTENNER.—E.
OLDSRENCEI, care of Kronbeimer & Olden
busch, 868 Butter St. Brookings, N. Y. A
morable closure is automatically operated by
of the container, and is automatically operated
after pressure thereon is relieved, and combines with such automatic closure, means
whereby its opening movement is limited so
that arcidetail displacement and discusses
that arcidetail displacement and discusses
prevented.

PROJECTICA AND METHOD OF FIRING

ion between the closure and the continer is prevented.

PRODECTILE AND METHOD OF FIRING THE SAME—I POWELL, VIIIIso Arnald. Tread, Italy. The is neverton has for its object support of the high explosive, and of the resistance of the high explosive, and of the resistance or itertia of the at 1 in high mountains the invention cambles artillery to reach piaces not approachable up till mov, it swoods many different to the proposal propo

Ps. This invention provides a device of the per leg type arranged for permitting the pag stump accket, or at an angle thereto, wherein means is provided for locking the parts in alloment, expanie of being easily locked or released through the civiling which will hold the parts in rigid alloment when in locked position.

position.

III CKET.—C II Ginnox and T. Carens, Box Silk Wenarches, Wash. This invention is especially adapted for use with the dredging apparatus in these inventors co-preding application and the second of the s



DREDGING BUCKET.

attended to be an operator through the medium of the handle seen in the illustration. This form of bucket is in use on their dredger now working in some of the most inaccessible places in Alaska and the Northwest

pinces in Alaska and the Northwest
AN ADLESPALIDE ANNITARY HAIR AND
THOTHI BRITISH—A. I. HOLTZMAN, 192 Central Ave. Beat (Gragor, M. J. This Inventor,
This Inventor,
The Committee of the Comm



ADJUSTABLE TOOTH BRUSH.

purpose, one is made of a handle having a seat for the reception of a bristle holder, and means for removally accurage the british holder on the seat of the adapted to be made in the seat of the sea

order.

BAFETY LOGGING HOUK—E J. LABRON,
Box 337 Marshfield, Ure. This invention pertains to holsting block and tackle, and has
particular reference to an improved hook
adapted especialty for use in connection with
a draft coble, such as is used for instance in
logging camps or like places where heavy ob-



SAFRTY LOGGING HOOK

jects are being drawn by distant power. The invention specifically covers certain details of construction embedging elements of cheap ness, maximum strength and highest efficiency and safety during operation. The cable is passed around a log as shown in the engraving, where it is represented in operative position.

The representation to operative post-time grate sections removed.

Household Visitides.

No. Child. A. N. M. The intention here is to provide a tiple having an outlet novel, and a closure cover. Bost 107. Reselvitis, obta. This distherefor, so formed and arranged that the vention has reference to extachments for bods,
closure will have a tight fit at all times in and more particularly it is directed to as inthe outlet orifier of the need, and will apt
proved construction especially adapted for use
removal.

The This invention comprehens more part
tivilatly a firstile coupling especially adapted FIXTURE—C. W. Schurz, 819. This flavors and many
tivilatly a firstile coupling especially adapted FIXTURE—C. W. Schurz, 819. This flavors
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pumping devices in order to railers the pipe is device for supporting a curtain and a bitist

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time of vibration. It is also adapted for use as a factite connection in any hydrastic time, of least, which conduits of the makes, is usually as a factite connection in any hydrastic time, of least, edited on the makes are in the connection of the makes and the makes are in the connection of the makes are in the connection of the con



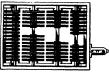
MOLDER FOR INC GREAM CONTES.

If for its cream comes, which may be manufactured at little expense, and which makes it tribute a great number of ice cream comes at one time, without it being meessary for him to brook the ice cream comes or to seel them. In this way the cream comes may be carried to the come of the com

Hardware and Tools.

HAND STAMP.—H. Neusaws and A. Dosses, 502 W 120th 8t, Mashattan, N. T., N. Y. The aim of this invention is to provide a stamping device more especially designed for stamping hears and other meats or other articles, and arranged to permit the operator to conveniently shadle the device so as to stamp a large number of articles in a comparatively short time.

Heating and Lighting.
FURNACE GRATE.—M. B. HAVESLA, P. O.
BOX 3, Anamona, lowa. This towestion is intended more particularly for embediment in
the grates of steam bolier furnaces, and it
relates to that type of grate in which renewable grate sections are provided. This invention improves grates in versions particulars
to the end that the grate sections, the grate
share, and the cret that on which the grate
share, and the cret that on which the grate



FURNACE GRATE.

hars are removably supported, may be conveniently removed and renewed when de-ired, and it minimizes the possibility of clinkers causing the breakage of grate sec-tions in the rocking of grate elements. The expraving shows a pian view with some of the grate sections removed.

THE REPORT OF THE PERSON OF TH



AUTOMATIC SPRINKING VALVE.

AUTOMATIC SPRINGLES VALVE, water critic is opened who subjected to inmassed of absorbed temperature. The operation depends upon the mixing of some fusible
metal, but in present derices the separation of metals being the mixing of some fusible
metal, but in present derices the separation of metals being the solder, makes of the second of the secon

#### Prime Wavers and Their Ac

Prime Hevers and Their Accessories
STRAM ENGINE.—M. A. GREEN, 642
Estate Trest Bidg., Philadelphia, Pa.
purpose here is the provision of simple,
nomical and easily operated means for v
ing the clearance of sach and of the cylli is order to increase or diminish the comj
sion and without affecting the total is not
of the cylinder or total length of the pisto

DESIGN FOR A HANDLE OF SCISSORS-BLADZE.—W M. Howse, care of Clayton Broa, 127 Dune St., New York, N. Y. In this case the design of a handle of scissors blades shows a result placeting in form with an ornamental feature on the inner edge of marked originality. D. W. L. Money M. M.

marked originality.
DBS(ON POR A DOLL.—Borrz M. Mirsm.
Colvillo, Wash. In this design for a doll a
small girl stands with girns outstretched and
is clothed in a dress whose creamental fost
successive summer decided over the whose
these squares being spread also over the bair
face and foct, and preducing an extremely
original and effective article.

Nora.—Copies of any of these patents will be furnished by the Sciantific AMBRICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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To th

Sturdy Jack **Gasoline Engine** 



# (Constuded from such tid.)

up the traches and out through the larynx outh in a coutinuous stream shall have thee escape. Later it was found of edvantage to interrupt the stream from three to six times a minute, to allow the lung to collapse for a moment at times and thus to get rid of the small quanti ties of carbon dioxide (the gas normally excreted from the body by exhalation) which are apt to remain in the pulmonary

We may no longer pursue this fairy tale of science, in which appear such illustrious names of physicians, surgeons and physicists as von Mikulics, Sauer-bruch, Fell, O'Dwyer, Matss, Kuhn, Vol-hard, Hirsch, Sollman Robinson, Elsberg, Carrel, and others, except to observe that the thoracic region, formerly a not me tangere, is now freely entered, and that many conditions formerly inoperable, from which patients had to die unre-ileved, are to-day successfully coped with Such are asphyxiation by drugs, smoke or immersion in water and such lesions as tuberculosis, abscess and gangrene of the lung; while the gullet, the aorta, the car-diac end of the stomach and so forth, can be reached with impunity.

We have now to describe the insuffic

tion apparatus for intratracheal anesthe sia devised (on the principles set forth by Dr. H. H. Janeway. This is a port able apparatus for administering ether capable of accurately gaging the supply of the latter, its dilution with warmed fil-tered air, and with mechanism for carefully regulating pressure and tempera-ture. There is an electro-motor running on direct or alternating 110-volt current, the speed of which is adjustable by means of a rheosist. A positive pressure blower nnected to the motor's shaft, and has at the other end a worm gear which regu-lates the periods of rhythmic inflations (inhalations and exhaltions) by a spe-cially constructed side valve actuated by this worm gearing. The pressure of the blower may be varied at will from nothing to 80 millimeters (Hg) if desired, and the air thus compressed passes through a muffler and filter whereby all impurities and odors are removed, noise being thus avoided as well. The filtered air passe by a special valve either directly over the surface of the water in the water in (which is heated by an electric heater) or it may first pass over the surface of or it may first pass over the surface of the ether in the ether jar, or through both jars at the same time, thus providing a parfect mixture. The amount of ether is controlled by a specially constructed epiral tube vaire, which admints the air directly at the surface of the find (six any level, according to the amount of ether used). A vaire placed between the two jars controls the air to enter the water or ether jar, or both. From the jars a pipe leads the ether-laden air to the time vaire and brunches off midway to a serjey seize, which may be set for the time varys and branches or minutes to a sefsty selec, which may be set for any pressure and will blow off any excess; a manometer connected to the blow off valve, by the difference in the mercury columns, shows the amount of pressure delivered to the patient. A small catch basin serves to prevent the accumulation of any moisture in the breathing tube, and thus only filtered warm air is ad-mitted into the patient's mouth. The elec-tric water heater acts almost instantan-sously, and a rheostat is provided for keeping the temperature fixed at a cer-tain degree, which may however be varied at will by the use of an electric current switch. The apparatus has a very wide range of application because of its vari-able speed and variable pressure. For intratracheal intraffaction few pressure beintracrease insumation any pressure of-low 20 millimeters is appropriate; while high pressure may be used in connection with a small cabinet, resembling a nega-tive and positive chamber—as air-tight compartment into which, through an encompartment into which, through an en-terding elastic collar, the head of the pa-tient is thrust for etherising. The com-plete large appearatis, weight 45 pounds, and is 35 for 12 by 10 inches for heaptial than 1 A smaller appearation weighing 25 pounds to designed for particle use and



Prof. Thomas B. Stitza...

The well-known research chemist on the well-known to the contain the contains the combiners and combiners that these samelines of Sanatosep are randor plate with seminor of Sanatosep are randor plate with seminor than the contains the

Charles D. Sigsbee
Rear Admetal, U. S. Navy, writer
"After a thorough trial of Sanatop
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John Temple Graves

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terror health and eirosthy—and so to some quity the entire years that dependent is improved, refribating sleep

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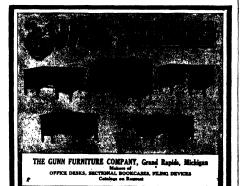


is in a lew finitutes each Gay—
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FELT & TARRANT MFG. CO., 1708 N. PAULINA ST., CHICAGO, ILL.



#### Forestry Eresion Proc (Canaluded from gage Mil.)

lel a tray from 4 to 7 feet squ and 6 inches deep, having been at first waterproofed, is filled with 4 inches of rubble and earth, with the general sizet of the surface toward the center of the front of the tray. Slight depressions are made as foundations for the two streams and for the two lakes. Over this is next placed 1 to 2 inches of mortar, consisting of one part cement and two parts sand The stream beds and lake depressions are worked in before the mortar sets, taking care that the outlets of the lakes are only slightly lower than the intakes at the mouths of the streams. This cement when dry, is waterproofed with hot paraffin, and a gutter is run along the front to receive the drippings of water as well as the runoff from the lakes. This water should empty into a waste pipe. In the rear of the model two mounds of earth, about 11/2 feet high, should be placed, with a depression between them. One of the mounds is covered thickly with moss, and through this small twigs or trimmings of hedges should be stuck to represent a forest. Stretches of nearly level land should extend from the bases of the hills to the lakes. The land below the forested hill should be covered with rich soil and that part adjacent to the stream and lake covered with moss to pre-vent washing. The other section should be barren and strewn with stones and amall boulders.

#### New Information on Forest Fires

THE subject of Forest Service Bulle-tin 117 has been strikingly brought to the public mind during the last few year by reason of the exceptional number of extensive forest fires, which have arise both on private and on public lands. The fact that the fall of 1910 was one of ex-ceptional drought in the western United States accounts for the prevalence of these fires, but they occur to a greater or less extent every year, and are a source of inestimable loss to the people of this country The present is an opportune time for the discussion of this subject, partly because of the extent of this enorous loss, but more because public atten tion may now be easily attracted, ins much as the general reader has recently been able to see and to figure out for himself the causes and the damage occasioned

Mr. Fred G. Plummer, the geograph of the Forest Service and author of this bulletin, has considered the subject un der the following headings: Sources and Scope of Information; Ancient Fires: Causes of Fires; Smoke Phenomena of Forest Fires; Historic Fires; Statistics of Damage and Loss.

The report is based upon statistics re The report is based upon statistics re-ceived from every State and Territory in the Union and as far back as there are available records. Every bit of informa-tion was reduced to a common standard and a card system devised for use in future compilation of forest fire statistics. The figures given in the final table of forest fires in the United States, Canada and Newfoundland embrace a record of the causes and of the number of fires total aren burned, and the amount and value of timber consumed. Credit is given by the author to others who had previously gathered statistics on the subct, but Mr. Plummer has succeeded in bringing together the most complete record which is presented in the most compact and intelligent manner. The reader will be impressed with the great care and technical skill exhibited in the preparation of this new and real unique preparation of this new and real unique report. While the builetin is assessarily technical in some parts, as for instance in the discussion which deals with smoke phenomens of forest fires, yet the nea-deb-nical reader will find a mass of data that will canable than to see for thismelf the great problem confronting the American





## GREDAG

RIFE MANS FURTHWOOD IN

SELENIUM AND ITS REMARKABLE PROPERTIES are fully described in Scientific American Supplement 1450. The paper is illustrated by numerous engravings. Price 10 cents. For sale by Munn & Co., Inc., and all newodesters.



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